Gavilan Water Conservation District
401 East Tenth Street, No. 3
Gilroy, California 95020

LUHDORFF & SCALMANINI
Consulting Engineers

ANNUAL INVESTIGATION
AND
REPORT OF GROUND-WATER CONDITIONS
1984-1985

GAVILAN WATER CONSERVATION DISTRICT

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ANNUAL INVESTIGATION
AND
REPORT OF GROUND-WATER CONDITIONS
1984-1985

GAVILAN WATER CONSERVATION DISTRICT

Prepared By:
Luhdorff and Scalmanini
Consulting Engineers
Woodland, California

March, 1986

Contents

TABLE OF CONTENTS

I. INTRODUCTION

II. GROUND-WATER MONITORING PROGRAM

III. GROUND-WATER CONDITIONS

- Occurrence of Ground Water
- Ground-Water Levels
- Ground-Water Pumpage
- Reservoir Storage and Ground-Water Recharge
- Ground-Water Storage and Overdraft
- Ground-Water Quality

IV. CONCLUSIONS

LIST OF FIGURES

		After Page
Figure 1	Gavilan Water Conservation District Boundaries and Principal Facilities	1
Figure 2	Ground-Water Monitoring Network, Llagas Subbasin, 1985	4
Figure 3	Llagas Ground-Water Subbasin	5
Figure 4	Generalized Geologic Cross-Section, San Martin to Pajaro River	6
Figure 5	Contours of Equal Ground-Water Elevation, Llagas Subbasin, Spring 1985	9
Figure 6	Contours of Equal Ground-Water Elevation, Llagas Subbasin, Fall 1985	9
Figure 7	Location Map, Water Level Measurement Wells	10
Figure 8	Historic Ground-Water Elevation Hydrograph, 9S/3E-15L1, Forebay Area	10
Figure 9	Historic Ground-Water Elevation Hydrograph, 9S/3E-16C1, Forebay Area	10
Figure 10	Historic Ground-Water Elevation Hydrograph, 9S/3E-16J1, Forebay Area	10
Figure 11	Historic Ground-Water Elevation Hydrograph, 9S/3E-26P1, Forebay Area	10
Figure 12	Historic Ground-Water Elevation Hydrograph, 10S/3E-3C1, Forebay Area	10
Figure 13	Historic Ground-Water Elevation Hydrograph, 10S/3E-13D3, Forebay Area	10
Figure 14	Historic Ground-Water Elevation Hydrograph, 10S/4E-7E99, Forebay Area	10
Figure 15	Historic Ground-Water Elevation Hydrograph, 10S/4E-17N2, Forebay Area	10
Figure 16	Historic Ground-Water Elevation Hydrograph, 10S/4E-30P5, Confined Area	10

LIST OF FIGURES
(Continued)

		After Page
Figure 17	Historic Ground-Water Elevation Hydrograph, 11S/4E-2D1, Confined Area	10
Figure 18	Historic Ground-Water Elevation Hydrograph, 11S/4E-8K1, Confined Area	10
Figure 19	Historic Ground-Water Elevation Hydrograph, 11S/4E-15J1, Confined Area	10
Figure 20	Historic Ground-Water Elevation Hydrograph, 11S/4E-17M1, Confined Area	10
Figure 21	Historical Ground-Water Pumpage, Gavilan Water Conservation District	11
Figure 22	Nitrate Concentrations, Llagas Subbasin	14
Figure 23	Total Dissolved Solids Concentrations, Llagas Subbasin	14

LIST OF TABLES

		After Page
Table 1	Ground-Water Monitoring Network	4
Table 2	Description of Geologic Units, South Santa Clara Valley-Hollister Basin Area	5
Table 3	Ground-Water Level Measurements, 1985, Gavilan Water Conservation District and the City of Gilroy	9
Table 4	Ground-Water Level Measurements, 1985, Santa Clara Valley Water District	9
Table 5	Ground-Water Quality Monitoring Program, Indicator Parameters, 1985, Gavilan Water Conservation District	14
Table 6	Ground-Water Quality Monitoring Program, General Mineral and Selected Inorganic Constituents	14

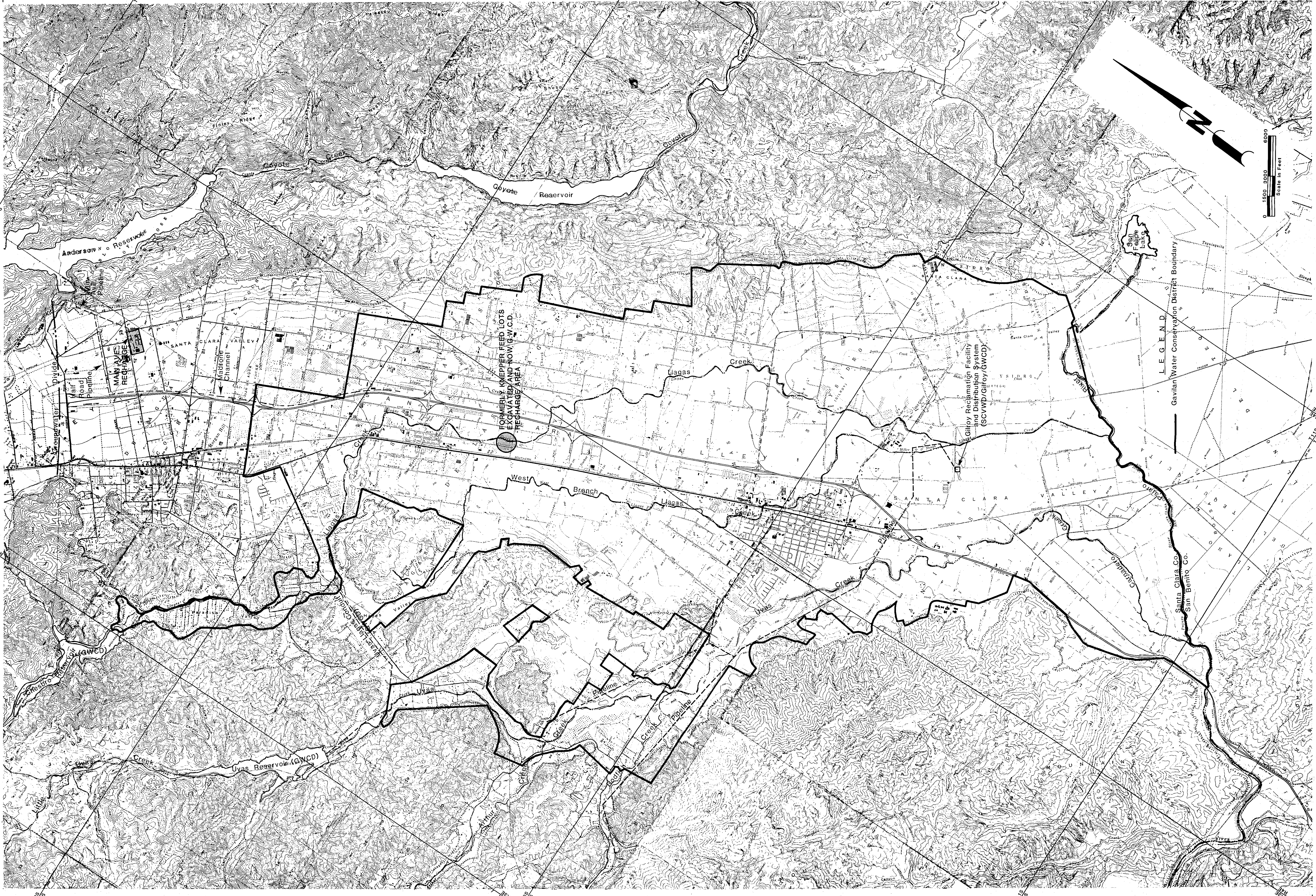
1

I. INTRODUCTION

The Gavilan Water Conservation District (GWCD) is involved in several water resource management activities in the south Santa Clara County area. Among its responsibilities is the preparation of an annual report, prepared in conformance with Sections 75560 and 75561 of the Water Conservation District Law of 1931, which requires that the District shall annually investigate and report on ground-water conditions within the District. To address the statutory requirements for report content, including certain optional information as desired by the District, this report is organized to include:

- a discussion of the District's ground-water monitoring program as implemented in 1985
- a description of the occurrence of ground-water resources within and immediately adjacent to the District
- a presentation of current and recent historic ground-water elevations
- a summary of 1984-85 and recent historic ground-water pumpage
- summaries of surface water storage in the District's two reservoirs, and releases from those reservoirs for in-stream and off-stream ground-water recharge
- a discussion of ground-water storage and overdraft
- a presentation of ground-water quality considerations resulting from the District's monitoring program.

For reference in the report, the District boundaries and the principal facilities within and adjacent to the District are illustrated in Figure 1.



Gavilan Water Conservation District Boundaries
and
Principal Facilities

Annual Ground-Water Conditions
1984-1985
Gavilan Water Conservation District

FIGURE 1
DATE March 1986
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2

II. GROUNDWATER MONITORING PROGRAM

Beginning in 1984, a ground-water monitoring network and program was developed and implemented by the District. The design of the monitoring program was based on geologic and hydrologic conditions within the Llagas Ground-Water Subbasin, with consideration to various areas of interest and concern within the District. A set of ground-water monitoring objectives was developed to serve as the basis for selecting certain existing wells and recommending new wells as parts of the monitoring network, and for recommending the types and frequency of ground-water data collection. Consideration was also given to existing monitoring programs such that existing data bases and available well data could be incorporated into the current program. In addition to the data collected by the District, water level and water quality data have also been contributed to the program by the Santa Clara Valley Water District (SCVWD) and the Cities of Gilroy and Morgan Hill.

At the outset of the program, several monitoring objectives were identified based on existing data and concerns regarding ground water in the District. These objectives, as outlined in the Ground-Water Monitoring Network and Program report (1984), included:

1. Qualification of wells and data to ensure that the source of data is known.

2. Measurement of ground-water levels in both the unconfined and confined aquifers within the District as an indication of or basis for determination of

ground-water storage, and to define hydraulic gradients and the associated direction of ground-water movement.

3. Measurement of aquifer characteristics in both unconfined and confined aquifers to analyze well performance and impact and, with hydraulic gradients, to analyze ground-water flow in the area.

4. Measurement of ground-water quality in both the unconfined and confined aquifers within the District to identify the current chemical quality of ground water.

5. Flexibility to allow for the addition or deletion of monitoring points or specific data, including the frequency of measurement or the analysis of samples collected, as the development of ground water in the area changes with time.

A general objective of the program was that data is collected by other State and local agencies be shared and incorporated into subsequent analyses in order to enhance the efficiency of data collection and the overall value of the monitoring program.

The original ground-water monitoring network proposed for the District (1984) consisted of 56 existing water supply wells. The network at that time included 25 wells to be monitored by Gavilan, 26 wells which were being monitored by the Santa Clara Valley Water District, and 5 wells which were being monitored by the City of Gilroy.

All 25 wells to be monitored by Gavilan were scheduled for bi-annual water level measurements. Water quality sampling was proposed for 18 of the 25 District wells, while the remaining 7 were to be measured for water levels only. During the early part of 1985, the 25 wells included in the District's program were field inspected to determine their suitability for water quality sampling and for obtaining water level measurements. The first field inspection, in January, 1985, identified several wells which were found to be unsuitable for water quality sampling due to the location of a pressure tank or other facilities upstream of a sampling point or potential sampling point. Some of the wells had no existing access for obtaining water level measurements. Based on a review of the specific objectives for monitoring at any given location, wells having known construction details were selected as potential replacements. These wells were then field inspected to ensure their suitability for monitoring.

After well qualification and field inspection activities, the monitoring network was revised to include 54 wells: 25 existing wells to be monitored by Gavilan, 29 wells to be monitored by the Santa Clara Valley Water District (SCVWD), and 6 wells to be monitored by the City of Gilroy. The District's current ground-water monitoring network is summarized in Table 1 and illustrated in Figure 2.

Results of the first year's (1985) data collection were incorporated into a summary report and are utilized in the following discussions of ground-water levels and ground-water quality.

TABLE 1
GROUND-WATER MONITORING NETWORK

WELL	OWNER	DEPTH (FT.)	SCREEN LOCATION (FEET)	MONITORING OBJECTIVES	AGENCY	REMARK	AREA ZONE	MONITORED IN 1985			
								WL	WQind	WQgen	WQorg
9S/3E-16J2	Oliva	400		Groundwater gradient south of groundwater divide (Llagas Subbasin) and upgradient of Main Avenue recharge	SCVWD	Qualify	F3			X	X
9S/3E-20F1	Khan, J. H.	150	65/105	Coyote/Llagas subbasin groundwater divide; upgradient of identified high nitrate areas	GWCD		F1	X	X	X	
9S/3E-21	Sasser	187	155/180	Downgradient of Morgan Hill industrial park; near identified high nitrate area	GWCD		F1	X	X	X	X
9S/3E-22	Bittick			Long term water level record	GWCD	Qualify	F3	X			
9S/3E-25N3	Bettencourt	380	180/200, 231/235, 250/260, 272/355	Area of identified high nitrate; downgradient of Madrone Channel recharge; long term water level record; downgradient of planned San Felipe artificial	SCVWD						
9S/3E-26N7	Serrano	195	85/185	Area of identified high nitrate; apparent plume spreading downgradient; downgradient of Madronne Channel recharge; long term water level record	GWCD		F1	X	X	X	
9S/3E-27G4	City of Morgan Hill	370	156/192, 240/360	Upgradient of identified high nitrate area; downgradient of Madronne Channel recharge	SCVWD		F3			X	X
9S/3E-33N	Vasquez	81	40/80	Near former Morgan Hill sewage disposal ponds; shallow	GWCD		F1	X	X	X	
9S/3E-35N8	Perry	120	76/116	Area of identified high nitrate; apparent plume spreading downgradient; downgradient of Madronne Channel recharge; long term water level record	GWCD		F1	X	X	X	
10S/3E-1E2	Hudson, P.L.	274	177/274	Area of identified high nitrate; apparent plume spreading downgradient; downgradient of Madrone Channel recharge; long term water level record	SCVWD		F1			X	X

TABLE 1
GROUND-WATER MONITORING NETWORK

WELL	OWNER	DEPTH (FT.)	SCREEN LOCATION (FEET)	MONITORING OBJECTIVES	AGENCY	REMARK	AREA ZONE	MONITORED IN 1985			
								WL	WQind	WQgen	WQorg
10S/4E-16J2	Wilber	160	120/160	Water levels and quality in east-central portion of basin	SCVWD		C2			X	X
10S/4E-28D3	Heinrich, G.	338	218/318	Upgradient of identified high nitrate area	SCVWD						
10S/4E-29F1	Cha	200	110/140, 127/140, 190/195	Extent of identified high nitrate area (upgradient boundary)	SCVWD		C3			X	X
10S/4E-31A1	Set	110		Located in identified high nitrate area	SCVWD	No log	C1			X	X
10S/4E-31	City of Gilroy (Well No. 7)	410	130/150, 200/350 380/400	Located in identified high nitrate area	City of Gilroy	WQ analyses for minerals and inorganics (1983)	C2	X		X	X
10S/4E-32H1	Higgins and Noll	450	190/408	Extent of identified high nitrate area	SCVWD		C2			X	X
10S/4E-34L5	Crumrine, P.	163	90/100, 128/131, 133/156	Extent of identified high nitrate area; long term water level record	SCVWD		C1			X	X
11S/3E-2C2	Arias	60	44/60	Upgradient of in-stream recharge; downgradient of tree farms and recycled water deliveries	GWCD		UV1	X	X	X	
11S/3E-2E1	Thomas	100	60/100	Upgradient of in-stream recharge; downgradient of tree farms and recycled water deliveries	SCVWD		UV1			X	X
11S/4E-4C8	Sturla, J.	215	28/38, 95/105, 210/215	Long term water level record; water quality	GWCD		C3	X	X	X	
11S/4E-4P3	McMillan	334	238/330	Located in identified high nitrate area	SCVWD		C2			X	X
11S/4E-5L4	Lemos	108	99/105	Located in identified high nitrate area; water quality vicinity of Gilroy Industrial Park	GWCD		C1	X	X	X	X
11S/4E-5K1	Berry, T.	113	84/112	Located in identified high nitrate area; vicinity of industrial development; shallow	SCVWD						
11S/4E-6B1	City of Gilroy (Well No. 1)	701	65/67, 80/105, 135/690	Extent of identified high nitrate area; migration toward Gilroy	SCVWD		C3			X	X
					City of Gilroy			X		X	X
11S/4E-6D1	City of Gilroy (Well No. 2)	470	108/324, 376/460	Extent of identified high nitrate area; migration toward Gilroy	City of Gilroy		C3	X		X	X

TABLE 1
GROUND-WATER MONITORING NETWORK

WELL	OWNER	DEPTH (FT.)	SCREEN LOCATION (FEET)	MONITORING OBJECTIVES	AGENCY	REMARK	AREA ZONE	MONITORED IN 1985 WL	WQind	WQgen	WQorg
11S/4E-6H1	City of Gilroy (Well No. 3)	364	98/345	Extent of identified high nitrate area; migration toward Gilroy	City of Gilroy	WQ analyses for minerals and inorganics (1982)	C3	X		X	X
11S/4E-6N	City of Gilroy (Well No. 4)	302	120/145, 170/270, 288/300	Extent of identified high nitrate area; migration toward Gilroy	City of Gilroy	WQ analyses for minerals and inorganics (1984)	C3	X		X	X
11S/4E-6	City of Gilroy (Well No. 6)	530	200/340, 450/480 490/510	Located in identified high nitrate area; vicinity of industrial development; deep	City of Gilroy		C2	X		X	X
11S/4E-8K1	Mondelli	278	53/65, 70/89, 100/112, 126/141, 194/274	Long term water level record	GWCD SCVWD		C3	X X		X	X
11S/4E-9M1	Norton Farm	400	130/210, 250/310, 350/390	Extent of identified area of high nitrate and high salt concentration (EC≥1,000 uS/cm)	SCVWD						
11S/4E-10D4	Barreras	370		Extent of identified area of high nitrate and high salt concentration(EC≥1,000 uS/cm)	SCVWD		C3	X		X	X
11S/4E-10D5	Maier, E.	325	300/325	Extent of identified area of high nitrate and high salt concentration (EC ≥1,000 uS/cm)	SCVWD		C2			X	X
11S/4E-10D14	Skrocki	140	120/140	Located in identifed area of high nitrate and high salt concentration	GWCD		C1	X	X	X	
11S/4E-10L4	Ybarra	400	150/170, 205/215, 330/350, 370/390	Extent of identified area of high nitrate and high salt concentration (EC≥1,000 uS/cm)	SCVWD						
11S/4E-15P1	Lintini, F.	248	161/188, 214/222, 234/242	Downgradient of Gilroy Sewage Disposal Ponds; located in identified area of high salt concentration (EC≥1,000 uS/cm)	SCVWD		C2			X	X
11S/4E-17	Christopher	200	132/190	Background water quality; long term water level record	GWCD		C2	X	X	X	
11S/4E-17L5	Barberi Farm	300	140/180, 200/220, 260/280	Downgradient of Uvas Creek areas of interest, i.e. nurseries, tree farms, in-stream recharge, and recycled water deliveries	SCVWD		C2			X	X
11S/4E-17M1	En	80		Long term water level record	GWCD SCVWD	Qualify	C1	X X			
11S/4E-17R2	Santos	272	70/83, 162/177 215/224, 243/254, 263/267	Located in identified high nitrate area; downgradient of Gilroy Sewage Disposal Ponds	GWCD	Possibly supplement with new shallow monitoring well	C3	X	X	X	

TABLE 1
GROUND-WATER MONITORING NETWORK

WELL	OWNER	DEPTH (FT.)	SCREEN LOCATION (FEET)	MONITORING OBJECTIVES	AGENCY	REMARK	AREA ZONE	MONITORED IN 1985			
								WL	WQind	WQgen	WQorg
11S/4E-21H5	Bettencourt	250	60/80, 170/200	Downgradient of Gilroy Sewage Disposal Ponds; located in identified area of high salt concentration (EC≥1,000 uS/cm)	GWCD		C3	X	X	X	
11S/4E-22N5	Gubser	219		Long term water level record	GWCD		C3	X			
11S/4E-33M2	Clark(Hansen)	290	60/290	Long term water level record	GWCD		C3	X			

F -- Forebay Area
C -- Confined Area
UV -- Uvas Creek Area
1 -- Shallow Zone
2 -- Deep Zone
3 -- Composite

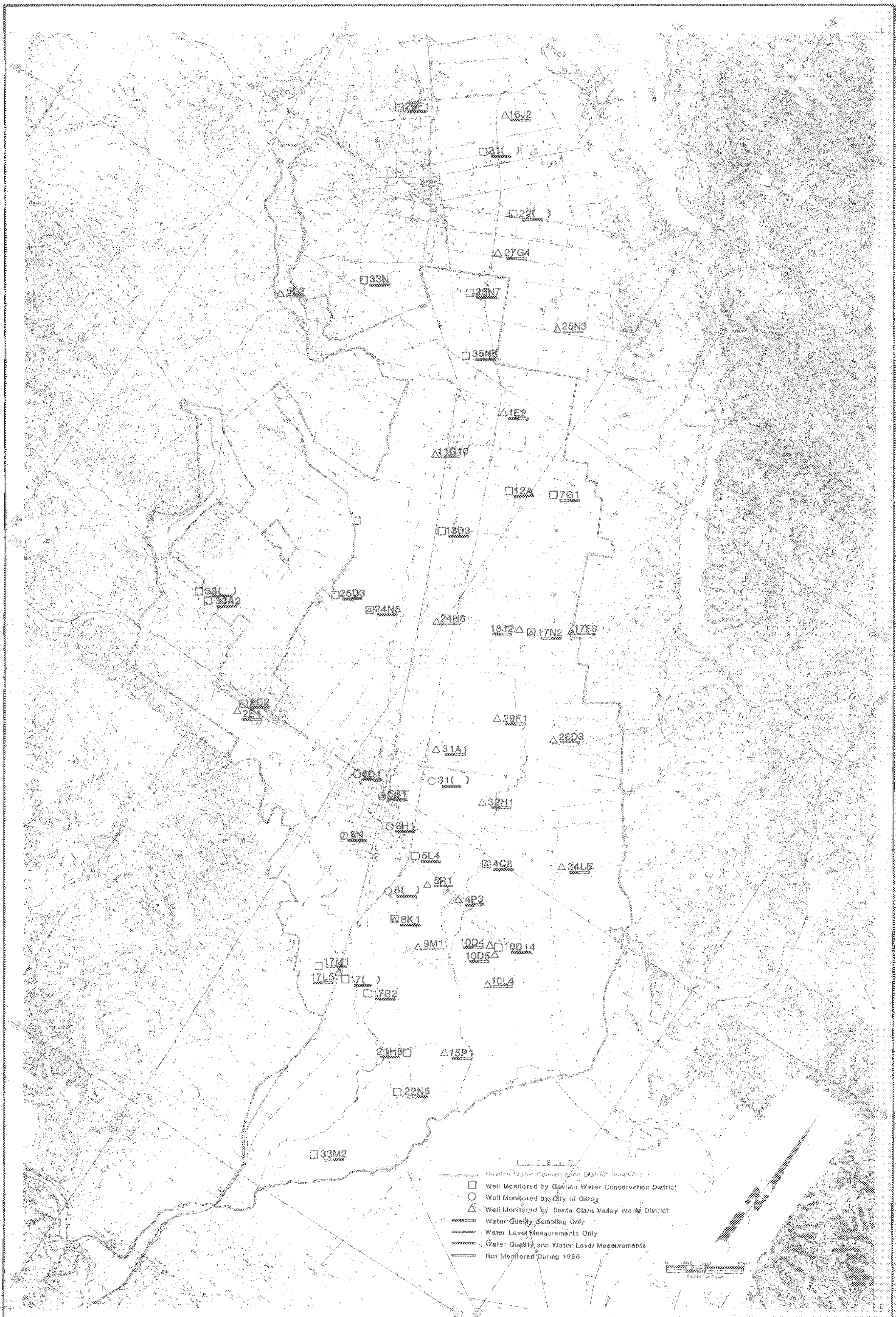
WL -- Water level

WQind -- Water quality indicator parameters: electrical conductance or total dissolved solids, chloride, and nitrate

WQgen -- General minerals and selected inorganics

WQorg -- Organic chemicals

uS/cm -- microsiemen/centimeter (1 microsiemen = 1 micromho)



□29F1
△16J2
□21( )
□22( )
△27G4
□33N
△5L2
□26N7
△25N3
□35N8
△1E2
△11G10
□12A
□7G1
□13D3
□33( )
□33A2
□25D3
⊠24N5
△24H6
18J2 △
⊠17N2
△17F3
□2C2
△2F1
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△31A1
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○6H1
○6N
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⊠4C8
△34L5
△5R1
○8( )
△4P3
⊠8K1
△9M1
10D4 △□10D14
10D5△
□17M1
17L5△□17( )
△10L4
□17R2
21H5□
△15P1
□22N5
□33M2
LEGEND
Gavilan Water Conservation District Boundary
□ Well Monitored by Gavilan Water Conservation District
○ Well Monitored by City of Gilroy
△ Well Monitored by Santa Clara Valley Water District
Water Quality Sampling Only
Water Level Measurements Only
Water Quality and Water Level Measurements
Not Monitored During 1985
0 1500 3000 6000
Scale in Feet
N

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Ground-Water Monitoring Network
Llagas Subbasin
1985

Annual Ground-Water Conditions
1984-1985
Gavilan Water Conservation District

FIGURE 2
DATE 3/86
PROJ. NO. 85-1-017

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III. GROUND-WATER CONDITIONS

Occurrence of Ground Water

The Gavilan Water Conservation District overlies the majority of the area in southern Santa Clara County which has been designated by the State Department of Water Resources (DWR, 1981) as the Llagas Subbasin, part of the Santa Clara-Hollister Ground-Water Basin. The boundaries of the Subbasin, illustrated on Figure 3, are defined by a hydraulic ground-water divide on the north, near Cochran Road, which separates the Llagas from the adjacent Coyote Subbasin; the valley floor, as defined by the contact between alluvial materials and bedrock on the east and west; and the Pajaro River on the south.

In the Llagas Subbasin are several geologic units (Table 2) which vary in their significance to ground-water supplies. Older geologic units of marine origin, such as the Franciscan Formation, occur beneath the significant water bearing formations and may locally produce some potable water; however, these units are generally characterized by low yields and poor quality saline or mineralized water.

The primary water bearing materials in the Llagas Subbasin are the unconsolidated alluvium and alluvial fan deposits which occur over the valley floor and range to a thickness of approximately 165 feet. The Santa Clara Formation, which underlies the alluvial deposits, is composed of well consolidated silt, clay, sand and gravel zones, and has been developed to several hundred feet within the Subbasin. The upper part of this Formation is indistinguishable from the overlying alluvium

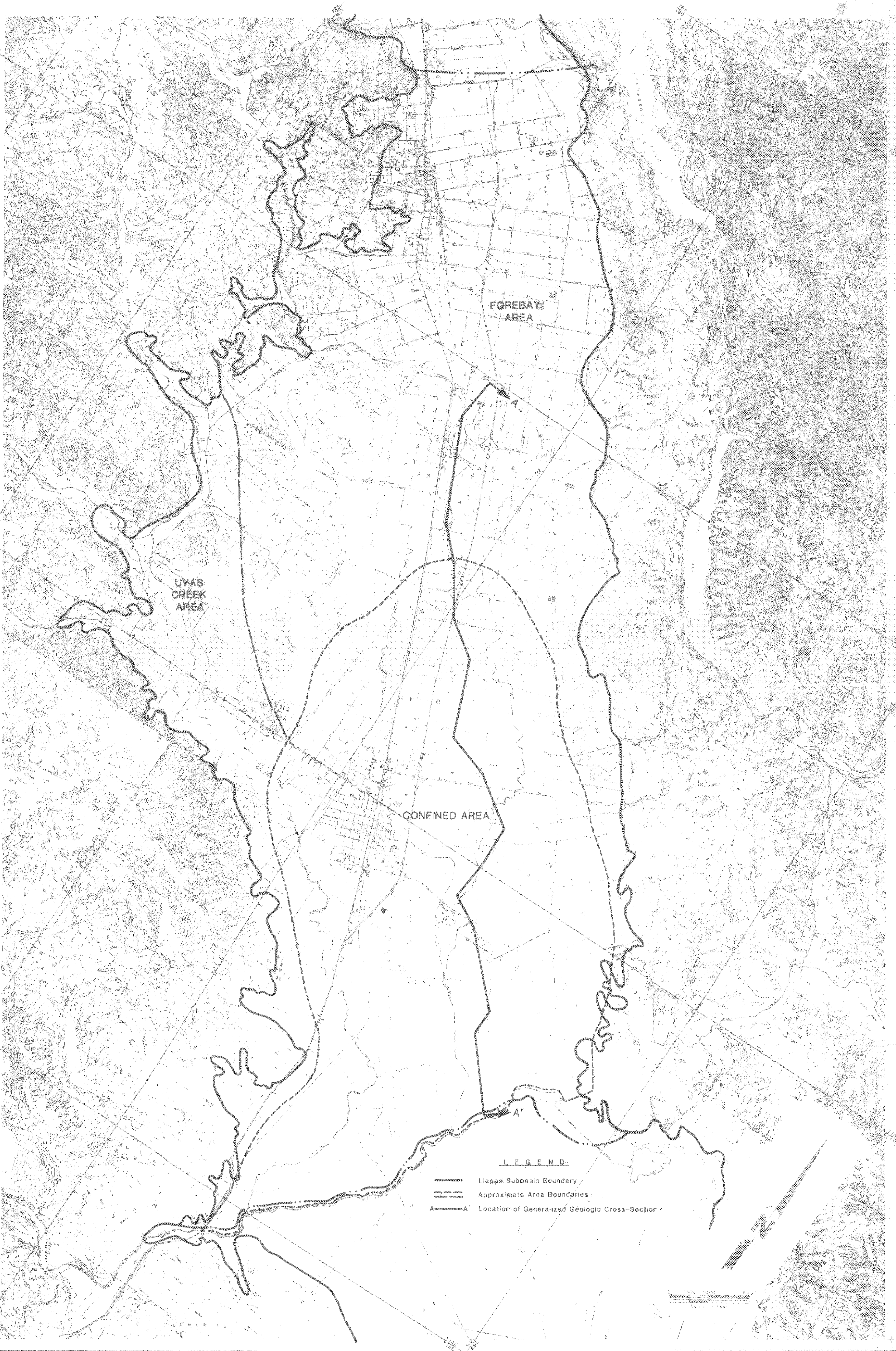
TABLE 2

Description of Geologic Units

South Santa Clara Valley – Hollister Basin Area

Geologic Age	Geologic Unit	Symbol	General Character, Location, and Thickness	Water-bearing Properties
Holocene	Landslides	Qls	Unstable masses of clay and rocks occurring on slopes east of Valley; may be as much as 15 m (50 ft.) thick.	Not a reliable source of ground water; locations of a number of springs and seeps.
	Stream Deposits	Qs	Unconsolidated gravel and sand in and near stream channel areas and on terraces; may be subject to flooding. May be as much as 15 m (50 ft.) thick.	May be good source of ground water in nonflooding areas; ground water is unconfined. Most ground water in this unit is underflow.
	Basin Deposits	Qb	Unconsolidated clay, silt and organic materials occurring in flat, undrained portions of Valley; saline soils are present in some areas. May be subject to ponding. May be as much as 30 m (100 ft.) thick.	Very low permeability, not a reliable source of ground water. Of no importance to ground water recharge.
	Younger Alluvium	Qy	Unconsolidated floodplain deposits of clay, silt, and sand; contains some zones of sandy gravel. May be as much as 30 m (100 ft.) thick.	Provides water to shallow wells. Important to ground water recharge. Ground water is generally unconfined.
	Alluvial fans	Qf	Unconsolidated to semiconsolidated sand, gravel, and clay occurring at edge of valley and at mouths of tributaries. May be as much as 37 m (125 ft.) thick. Deposits of clayey gravel underlying older alluvium probably belong to this unit.	Generally yields large amounts water to properly-constructed wells. Most ground water is under some degree of confinement.
Plio-Pleistocene	Older Alluvium	Qo	Unconsolidated older floodplain deposits of clay, silt, and sand with predominant clay subsoil. May be as thick as 37 m (125 ft.) near the axis of the valley.	Provides some water to wells; most wells located on this unit produce water from underlying materials. Ground water varies from unconfined to confined.
	Santa Clara Formation	TQs	Folded and faulted beds of consolidated silt, clay, and sand; occasional zones of gravel. Exposed to east of valley; occurs at depth under valley floor. Up to 550 m (1,800 ft.) of stratigraphic thickness.	A major water-bearing formation. Many deep wells in valley areas tap upper part of this formation, yielding large quantities of good quality water.
	Volcanic rocks	TQv	Basalt and basic intrusives occurring in hills to east of valley. Occur interbedded with Santa Clara Formation; present in subsurface beneath floor of valley. Thickness not known.	Of little importance to ground water.
Pliocene	Purisima Formation	Tp	Folded and faulted beds of massive micaceous siltstone, sandstone, conglomerate, and gypsiferous shale cropping out west of Hollister Basin; occurs at depth beneath some valley floor areas. Stratigraphic thickness is as much as 4,600 m (15,000 ft.); most of formation is of marine origin.	Uppermost 600 m (2,000 ft.) contains good quality water under confined conditions; remainder of formation contains saline water.
Miocene	Tertiary Marine Sediments	Tm	Fossiliferous conglomerate and sandstone; siliceous shale and mudstone. All are of marine origin. Exposed in hills west of Gilroy. Of undetermined thickness.	Generally contains saline water. A few low-yielding wells tap potable water contained in fractures and flushed zones.
Cretaceous	Great Valley Sequence	K	Folded, thinly-bedded shale, sandstone, and conglomerate; all of marine origin. Estimated thickness 12,000 m (40,000 ft.).	Contains saline and mineralized water.
Jura-Cretaceous	Franciscan Formation	JKf	Folded, faulted, and sheared lithic sandstone and shale, altered basalt, diabase, and tuff; chert, greenstone, limestone, and melange. All of marine origin. Estimated thickness 15,000 m (50,000 ft.).	Of no significant importance to ground water.
	Ultrabasic rocks	ub	Green to black serpentine. of undetermined thickness.	Of no importance to ground water.

From: DWR, 1981



LEGEND

- Llagas Subbasin Boundary
- Approximate Area Boundaries
- A——A' Location of Generalized Geologic Cross-Section

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Llagas Ground-Water Subbasin

Annual Ground-Water Conditions 1984-1985

Gavilan Water Conservation District

FIGURE	3
DATE	3/86
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due to the similarity in aquifer materials.

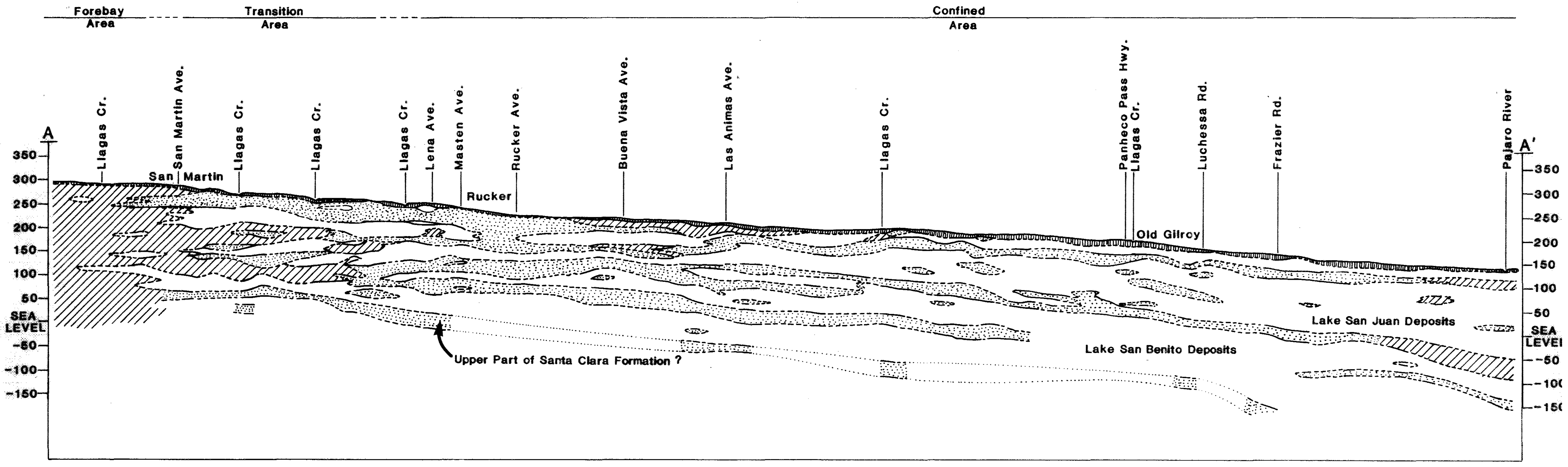
The deposition of alluvial materials, including older alluvium, younger alluvium, alluvial fans, basin deposits, lake deposits and stream deposits, influences the occurrence of unconfined and confined aquifer conditions. From just north of San Martin Avenue to near old Gilroy in the south, ancient lake bed deposits (Lake San Benito), composed of clays and silts, exist at elevations of 295 feet mean sea level (MSL) and below; these deposits progressively thicken from just north of San Martin Avenue to the Pajaro River, and beyond, in the south. Near San Martin Avenue, the Lake San Benito clays are at a depth of approximately 165 feet. Post lake erosion and deposition has formed a zone of interconnected aquifer material ranging from a thickness of approximately 65 to 130 feet and extending from San Martin Avenue to approximately Bloomfield Road (DWR, 1981).

Overlying the zone of post Lake San Benito sediments in valley areas, below the 195 foot elevation, is a zone of lacustral clay and discrete zones of sandy material attributable to the more recent Lake San Juan. These sediments attain a maximum thickness of approximately 195 feet at the southern end of the Llagas Subbasin where they lie directly on San Benito clays. North of the approximate limit of Lake San Juan, older alluvial deposits and basin deposits consisting of less permeable aquifer materials may act as locally confining zones. Figure 4, a generalized cross-section along the length of the Llagas Subbasin (adapted from DWR, 1963), depicts the hydrogeologic conditions described above.

For the purpose of evaluating hydrologic and water quality conditions, the Llagas Subbasin has been divided into three general areas: the Forebay area, the

Generalized Geologic Cross-Section
San Martin to Pajaro River

FIGURE 4



(Adapted from DWR, 1963)

L E G E N D

▥ Soil

░ Sand and Gravel

▨ Alternating Thin Discontinuous Layers of Gravel and Silt or Clay

☐ Silt or Clay

Confined area, and the Uvas Creek area. These three areas are shown on Figure 3 and described below. These three areas were further subdivided into zones based on the general geologic conditions described above. Wells included in the ground-water monitoring network are classified according to location and are also included in the "upper" or "lower" zone if known well construction details indicated a primarily shallow or deep completion. Wells perforated in shallow and deep aquifers are classified as "composite". The individual well designations, for the monitoring network wells, are included in Table 1.

Forebay Area--The forebay area overlies the northern half of the Subbasin. Although this area has also been classified by previous investigators as unconfined, lithologic evaluation of wells completed in the Morgan Hill area indicates locally confined to semi-confined conditions. There exist three, and possibly four, clay horizons which appear to be consistent in elevation, thickness, and stratigraphic position. These clay horizons range in thickness from approximately 15 to 50 feet and occur at depths ranging from 50 to 310 feet. These quaternary floodplain, or valley fill, materials exist at elevations above sea level and tend to thin and pinch out toward the boundary of the Subbasin. Interstratified with these thin clay beds are four alluvial horizons consisting of sandy gravel to cobbley deposits. These fluvial and alluvial fan deposits, ranging in thickness from approximately 30 to 60 feet, are generally coarser toward the Valley sides and to the north of Morgan Hill.

Confined Area--The confined area comprises the area that is more or less continuously overlain by fine-grained lacustrine deposits (clays and silts) from Lakes San Juan and San Benito. As discussed above, thick clay beds occur in the southern end of the Subbasin. There appear to be two relatively continuous aquifers in the confined area: one overlying the Lake San Benito deposits at elevations near sea level and one overlying the Lake San Juan deposits at elevations greater than 100 feet. As evidenced by well completion intervals in this area, there are permeable materials which exist between and below these zones; however, their continuity within the confined area is uncertain. Similarly, toward the northern part of the confined area, aquifer materials tend to coarsen and thicken while the finer-grained deposits thin and become discontinuous. The general area of transition from primarily unconfined to confined conditions is indicated on Figure 4. South of Gilroy, locally unconfined ground-water conditions, which have in previous reports been referred to as "perched" ground water, may exist in shallow formations.

Uvas Creek Area--The Uvas Creek area, is located west of the City of Gilroy along the western edge of the Subbasin. This area has also been designated the "western forebay" by the Santa Clara Valley Water District.

In the southeast part of the Uvas Creek area, a thick sequence of fine-grained (clayey) material, ranging in thickness from 50 to 100 feet, exists at depths of 30 to 100 feet. This fine-grained sequence is believed to be lacustrine clays and silts deposited from Lake San Juan. The uppermost portion of the finer-grained sequence extends to the boundary dividing the "Uvas Creek" and "confined" areas. Lower portions of the fine-grained sequence may extend approximately 3,500 feet further to the west. Overlying this fine-grained sequence is a zone of interstratified stream channel, floodbasin and basin deposits consisting of sands, gravels, and clayey beds.

Ground-Water Levels

Historically, the District has recorded ground-water levels by collecting monthly measurements of depth to water in twelve wells throughout the District; and it has reported those by averaging the twelve depths to water as an indicator of District-wide ground-water levels (unless one or more wells was flowing, in which case the water level(s) was not measured or included in the average "depth" to water).

During 1985, as part of its new ground-water monitoring program, the Gavilan Water Conservation District measured ground-water levels in 25 wells during the Spring and again in the Fall. The Santa Clara Valley Water District measured ground-water levels on a generally quarterly frequency in 49 wells. The City of Gilroy obtained monthly water levels from their 6 wells. The Spring and Fall data from all three agencies are summarized in Tables 3 and 4. Based on this data, contour maps of equal ground-water elevations have been prepared for Spring and Fall, 1985 and are included as Figures 5 and 6.

Based on both Spring and Fall ground-water contours, the general direction of regional ground-water flow is southerly from a ground-water divide in the northern part of the Llagas Subbasin, in the vicinity of Cochran Road, toward the Pajaro River at the southern Subbasin boundary. Ground-water gradients range from approximately 0.002 to 0.02 in the northern part of the Subbasin and from approximately 0.001 to 0.005 in the southern part of the Subbasin. Ground-water gradients are generally steepest to the northeast and northwest of Morgan Hill.

TABLE 3

GROUND-WATER LEVEL MEASUREMENTS
1985
GAVILAN WATER CONSERVATION DISTRICT
AND THE
CITY OF GILROY

AGENCY	STATE NO.	WELL IDENTIFICATION	LAND SURFACE ELEVATION (FT.,MSL)	DEPTH TO GROUND-WATER SPRING (FT.)	DEPTH TO GROUND-WATER FALL (FT.)	CHANGE	GROUND-WATER ELEVATION SPRING (FT.,MSL)	GROUND-WATER ELEVATION FALL (FT.,MSL)
GWCD	09S/3E-20F01	Khan	380	21.25	29.40	-8	359	351
GWCD	09S/3E-21	Sasser	368	64.15	73.60	-9	304	294
GWCD	09S/3E-22	Bittick	361	54.75	72.75	-18	306	288
GWCD	09S/3E-26N07	Serrano	324	31.05	49.10	-18	293	275
GWCD	09S/3E-33N	Vasquez	360	15.95	29.45	-14	344	331
GWCD	09S/3E-35N08	Perry	306	24.55	41.95	-17	281	264
GWCD	10S/3E-12A	Alfrey	271	38.70	51.45	-13	232	220
GWCD	10S/3E-13D03	Perino	260	37.85	45.65	-8	222	214
GWCD	10S/3E-24N05	Williamson	232	13.95	27.95	-14	218	204
GWCD	10S/3E-25D03	Blaetter	231	10.40	30.20	-20	221	201
GWCD	10S/3E-33	Colt	292	35.80	36.65	-1	256	255
GWCD	10S/3E-33A02	Linda Vista	294	35.70	36.85	-1	258	257
GWCD	10S/4E-07G01	Bollenbacher	307	77.45	92.55	-15	230	214
GWCD	10S/4E-17N02	Pourroy	255	53.45	62.35	-9	202	193
GWCD	11S/3E-02C02	Arias	232	18.35	19.65	-1	214	212
GWCD	11S/4E-04C08	Sturla	190	28.80	38.90	-10	161	151
GWCD	11S/4E-05L04	Lemos	186	20.75	36.10	-15	165	150
GWCD	11S/4E-08K01	Mondelli	179	18.85	33.75	-15	160	145
GWCD	11S/4E-10D14	Skrocki	171	18.95	28.95	-10	152	142
GWCD	11S/4E-17	Christopher	180	30.10	44.40	-14	150	136
GWCD	11S/4E-17M01	En	180	20.35	33.45	-13	160	147
GWCD	11S/4E-17R02	Santos	176	41.05	40.00	1	135	136
GWCD	11S/4E-21H05	Bettencourt	165	NA	31.40	NA	NA	134
GWCD	11S/4E-22N05	Gubser	150	10.80	20.50	-10	139	130
GWCD	11S/4E-33M02	Clark	136	ARTESIAN	5.95	-6	NA	130
GILROY	11S/4E-06B01	City of Gilroy, NO.1	200	28	63	-35	172	137
GILROY	11S/4E-06D01	City of Gilroy, NO.2	213	34	59	-25	179	154
GILROY	11S/4E-06H01	City of Gilroy, NO.3	195	NA	49	-49	NA	146
GILROY	11S/4E-06N	City of Gilroy, NO.4	205	32	57	-25	173	148
GILROY	11S/4E-08	City of Gilroy, NO.6	185	19	46	-27	166	139
GILROY	10S/4E-31	City of Gilroy, NO.7	193	20	45	-25	173	148

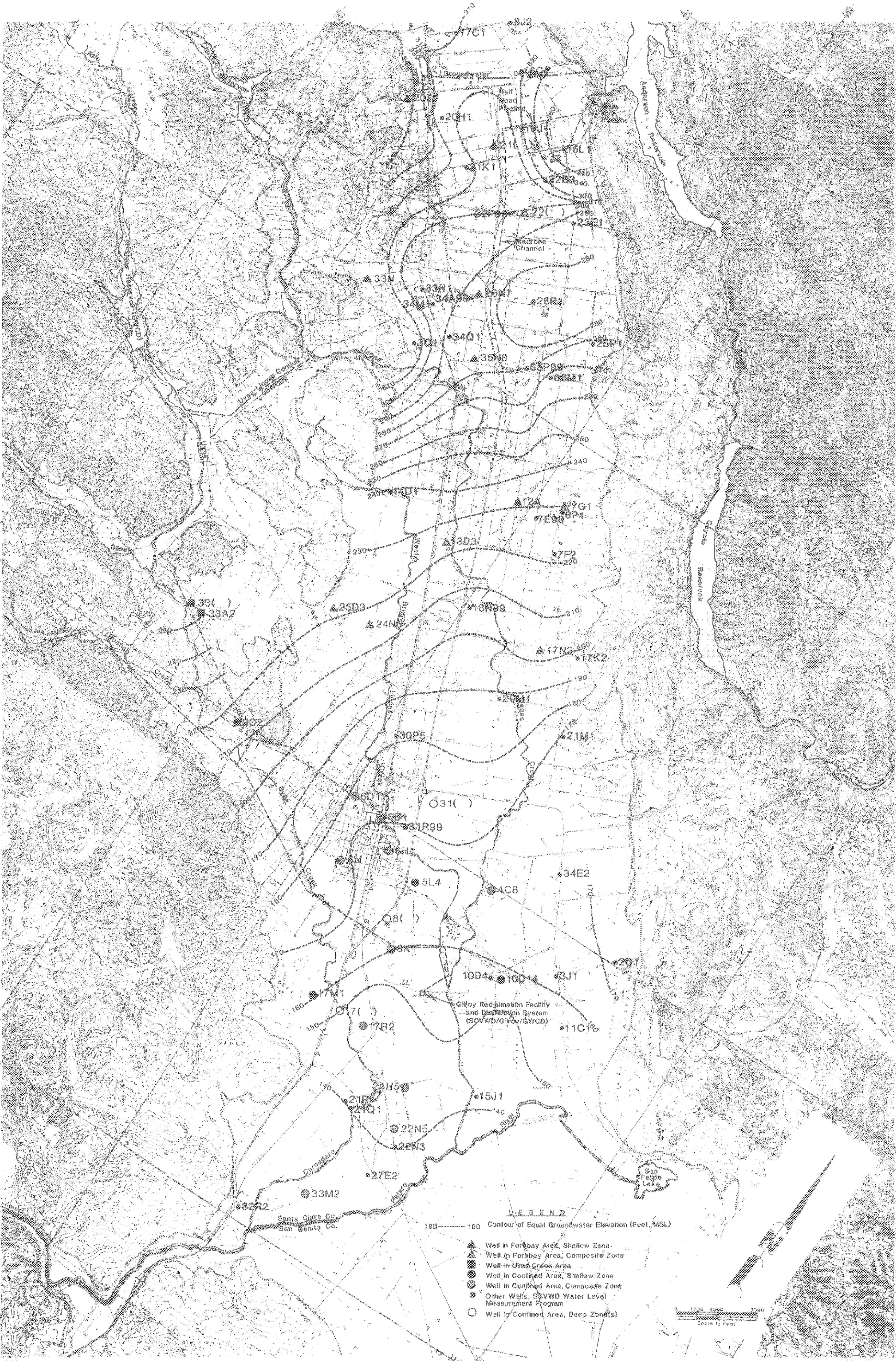
NA -- Not available or not measured

TABLE 4

GROUND-WATER LEVEL MEASUREMENTS
1985
SANTA CLARA VALLEY WATER DISTRICT

STATE NO.	LSD METERS	LSD FEET	DEPTH SPRING METERS	DEPTH SPRING FEET	DEPTH FALL METERS	DEPTH FALL FEET	CHANGE	GROUND-WATER ELEVATION SPRING(FT,MSL)	GROUND-WATER ELEVATION FALL(FT,MSL)
09S/3E-08J02	111.6	366.1	15.0	49.2	23.6	77.4	-28.2	316.9	288.7
09S/3E-15L01	118.9	390.1	3.4	11.2	NA	0.0	11.2	378.9	NA
09S/3E-16C01	117.7	386.2	22.3	73.2	32.5	106.6	-33.5	313.0	279.5
09S/3E-16J01	117.3	384.8	22.3	73.2	30.8	101.0	-27.9	311.7	283.8
09S/3E-17C01	107.0	351.0	12.8	42.0	16.8	55.1	-13.1	309.1	295.9
09S/3E-20H01	107.6	353.0	11.9	39.0	15.3	50.2	-11.2	314.0	302.8
09S/3E-21K01	110.3	361.9	14.3	46.9	23.5	77.1	-30.2	315.0	284.8
09S/3E-22B03	113.4	372.0	17.9	58.7	18.3	60.0	-1.3	313.3	312.0
09S/3E-22P99	107.9	354.0	16.5	54.1	21.5	70.5	-16.4	299.9	283.5
09S/3E-23E01	110.9	363.8	23.2	76.1	31.1	102.0	-25.9	287.7	261.8
09S/3E-25P01	107.9	354.0	22.9	75.1	34.5	113.2	-38.1	278.9	240.8
09S/3E-26P01	100.3	329.1	NA	NA	NA	NA	NA	NA	NA
09S/3E-33H01	96.0	315.0	11.1	36.4	19.1	62.7	-26.2	278.5	252.3
09S/3E-34A99	96.3	315.9	8.8	28.9	14.9	48.9	-20.0	287.1	267.1
09S/3E-34M01	97.2	318.9	6.7	22.0	13.1	43.0	-21.0	296.9	275.9
09S/3E-34Q01	95.7	314.0	7.3	23.9	12.8	42.0	-18.0	290.0	272.0
09S/3E-35N01	93.9	308.1	7.3	23.9	12.2	40.0	-16.1	284.1	268.0
09S/3E-35P99	93.3	306.1	6.0	19.7	11.6	38.1	-18.4	286.4	268.0
09S/3E-36M01	94.5	310.0	13.4	44.0	19.7	64.6	-20.7	266.1	245.4
10S/3E-03C01	107.6	353.0	6.4	21.0	13.4	44.0	-23.0	332.0	309.0
10S/3E-13D03	79.6	261.2	11.2	36.7	14.0	45.9	-9.2	224.4	215.2
10S/3E-14D01	82.6	271.0	9.8	32.2	15.5	50.9	-18.7	238.8	220.1
10S/3E-23J02	71.6	234.9	4.8	15.7	14.0	45.9	-30.2	219.2	189.0
10S/4E-06P01	93.3	306.1	23.6	77.4	28.2	92.5	-15.1	228.7	213.6
10S/4E-07E99	87.5	287.1	14.3	46.9	19.9	65.3	-18.4	240.2	221.8
10S/4E-07F02	91.7	300.8	24.1	79.1	28.8	94.5	-15.4	221.8	206.4
10S/4E-17K02	90.2	295.9	29.5	96.8	35.2	115.5	-18.7	199.1	180.4
10S/4E-17N02	78.0	255.9	15.9	52.2	NA	NA	NA	203.7	NA
10S/4E-18N99	74.4	244.1	NA	NA	NA	NA	NA	NA	NA
10S/4E-20M01	67.1	220.1	9.5	31.2	14.0	45.9	-14.8	189.0	174.2
10S/4E-21M01	71.3	233.9	19.5	64.0	NA	NA	64.0	169.9	NA
10S/4E-30P05	63.4	208.0	8.4	27.6	13.7	44.9	-17.4	180.4	163.1
10S/4E-31R99	58.5	191.9	6.9	22.6	13.1	43.0	-20.3	169.3	148.9
10S/4E-34E02	62.2	204.1	11.9	39.0	18.6	61.0	-22.0	165.0	143.0
11S/4E-02D01	69.8	229.0	17.0	55.8	16.5	54.1	1.6	173.2	174.9
11S/4E-03J01	59.7	195.9	10.2	33.5	20.7	67.9	-34.4	162.4	128.0
11S/4E-04C03	58.2	190.9	6.9	22.6	13.4	44.0	-21.3	168.3	147.0
11S/4E-06B01	60.7	199.1	8.5	27.9	19.2	63.0	-35.1	171.3	136.2
11S/4E-06H01	59.1	193.9	NA	NA	14.9	48.9	-48.9	NA	145.0
11S/4E-08K01	49.7	163.1	5.1	16.7	11.5	37.7	-21.0	146.3	125.3
11S/4E-10D04	51.8	169.9	3.4	11.2	12.5	41.0	-29.9	158.8	128.9
11S/4E-11C01	53.3	174.9	6.0	19.7	14.3	46.9	-27.2	155.2	128.0
11S/4E-15J01	43.9	144.0	0.0	0.0	7.0	23.0	-23.0	144.0	121.1
11S/4E-17M01	54.9	180.1	5.8	19.0	12.0	39.4	-20.3	161.1	140.7
11S/4E-21P01	47.2	154.9	2.2	7.2	9.4	30.8	-23.6	147.6	124.0
11S/4E-21Q01	47.2	154.9	4.1	13.5	NA	NA	13.5	141.4	NA
11S/4E-22N03	45.7	149.9	2.4	7.9	9.8	32.2	-24.3	142.1	117.8
11S/4E-27E02	44.2	145.0	NA	NA	9.0	29.5	-29.5	NA	115.5
11S/4E-32R02	42.7	140.1	2.4	7.9	8.8	28.9	-21.0	132.2	111.2

LSD - Land Surface Elevation, mean sea level
NA - Measurements available for Summer and/or Winter months



LUHDORFF & SCALMANINI
Consulting Engineers
Woodland, California 95695

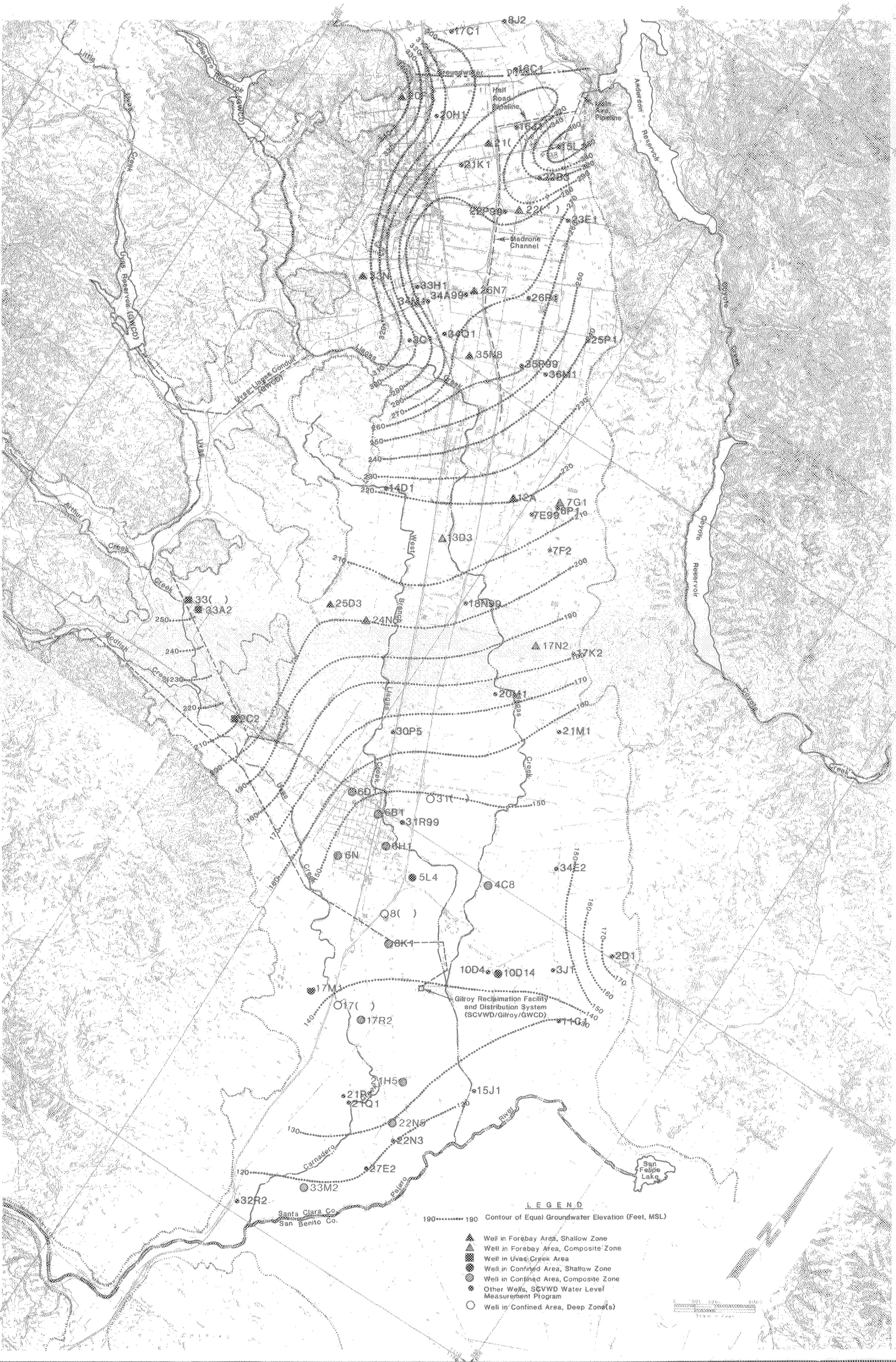
DES.
DRWN. BY
CHK. BY
APPR. BY

NO.	DATE	REVISION	BY	APPR.

Contours of Equal Ground-Water Elevation
Llagas Subbasin
Spring, 1985

Annual Ground-Water Conditions
1984–1985
Gavilan Water Conservation District

FIGURE 5
DATE 3/86
PROJ. NO. 86-1-017



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Contours of Equal Ground-Water Elevation
Llagas Subbasin
Fall, 1985

Annual Ground-Water Conditions
1984–1985
Gavilan Water Conservation District

FIGURE 6
DATE 3/86
PROJ. NO. 86-1-017

Gradients are also relatively steeper southeast of Morgan Hill along Llagas Creek.

To examine local ground-water levels and trends, including seasonal water level fluctuations, in both the unconfined and confined areas of the Subbasin, thirteen wells have been selected for preparation of historical hydrographs based on: location, qualification (known depth and completion), and availability of historical water level data. The locations of the thirteen wells, all of which are located in the forebay and confined areas, are illustrated in Figure 7. Due to the relatively recent construction of most wells in the Uvas area and the consequent lack of historic water level data, no wells in that area were selected for preparation of water level hydrographs.

On a long term (15 to 20 years) basis, ground-water levels have remained fairly constant throughout the south County area. Of note on all the hydrographs (Figures 8 through 20) are yearly seasonal fluctuations, some short term trends, one or two significant events, and current levels very similar to those in the late 1960's and early 1970's.

For the recorded time period, the most dramatic short term trend is the rapid decline of water levels in the vicinity of the ground-water divide at the north end of the Subbasin, where water levels in wells 9S/3E-16C1 and -16J1 have declined 50 to 60 feet since 1983. However, well 9S/3E-15L1 in the adjacent section has shown no recent water level trend; and all three wells have water levels comparable to pre-drought and late 1960's conditions. Farther to the south, but still in the forebay area, there are recent, short term, small declines in water levels. Here again, however, water levels are at pre-drought and late

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Location Map
Water Level Measurement Wells

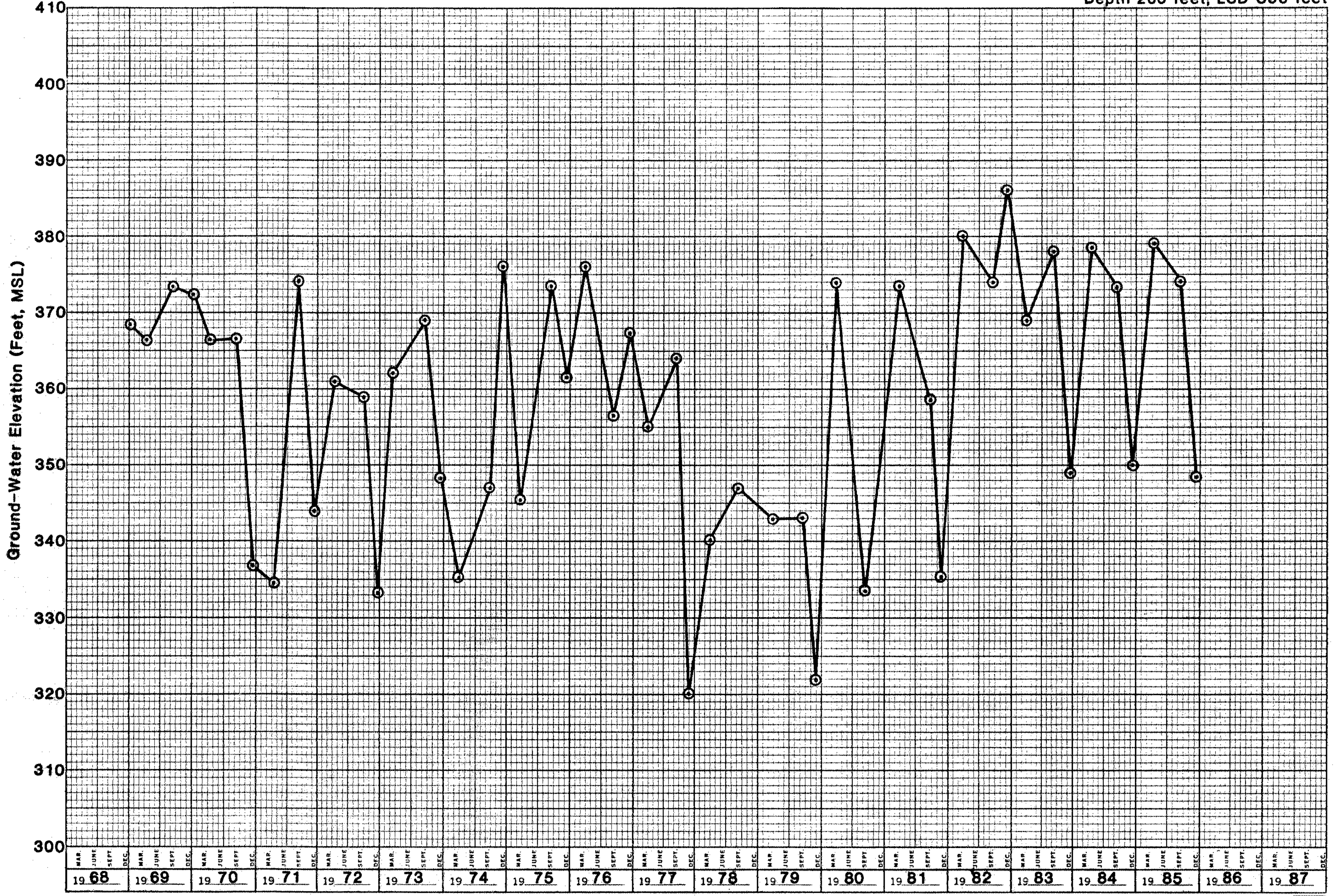
Annual Ground-Water Conditions
1984-1985
Gavilan Water Conservation District

FIGURE 7
DATE March 1986
PROJ. NO. 86-1-017

Historic Ground-Water Elevation Hydrograph

FIGURE 8

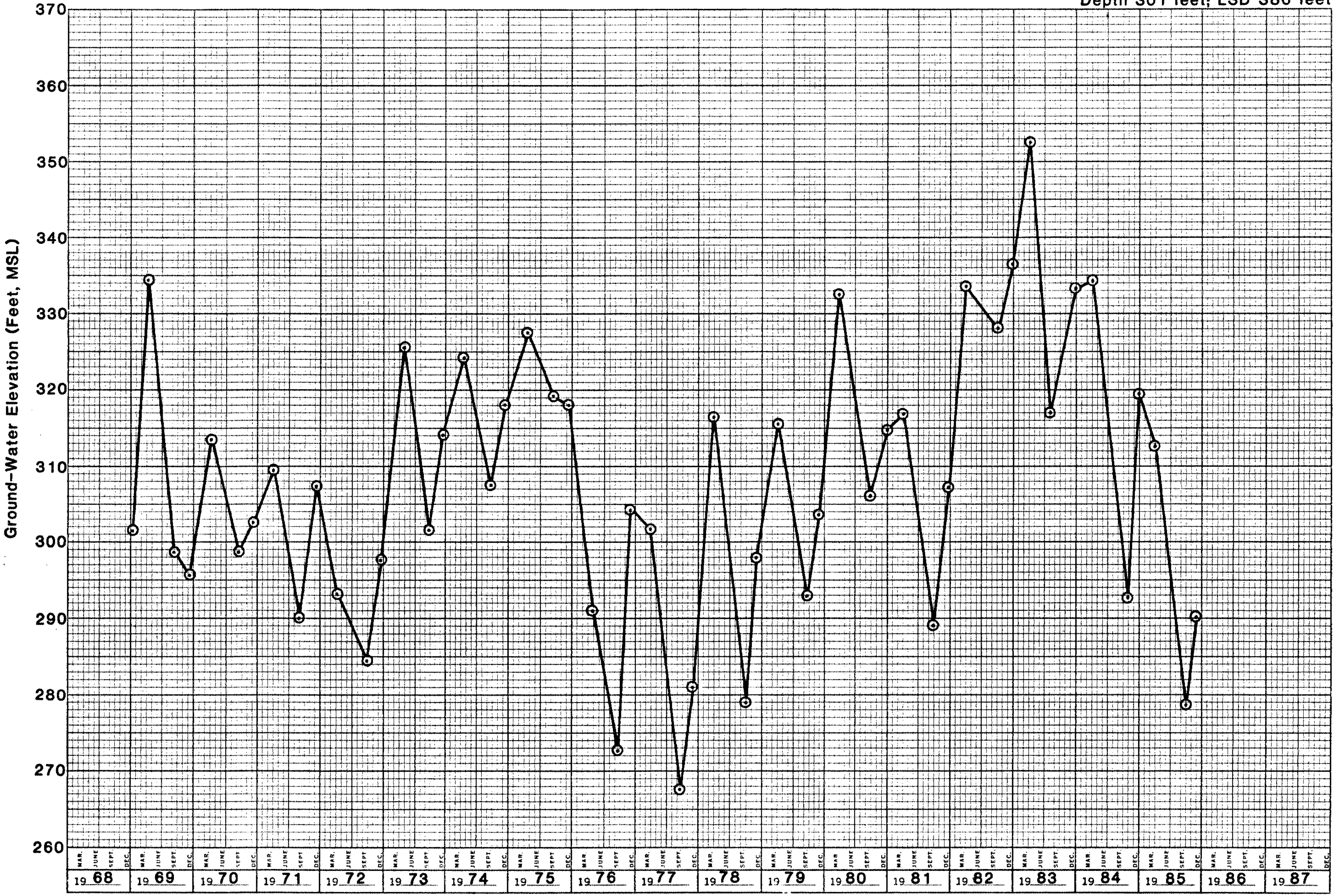
9S/3E-15L1 Forebay Area
Depth 200 feet; LSD 390 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 9

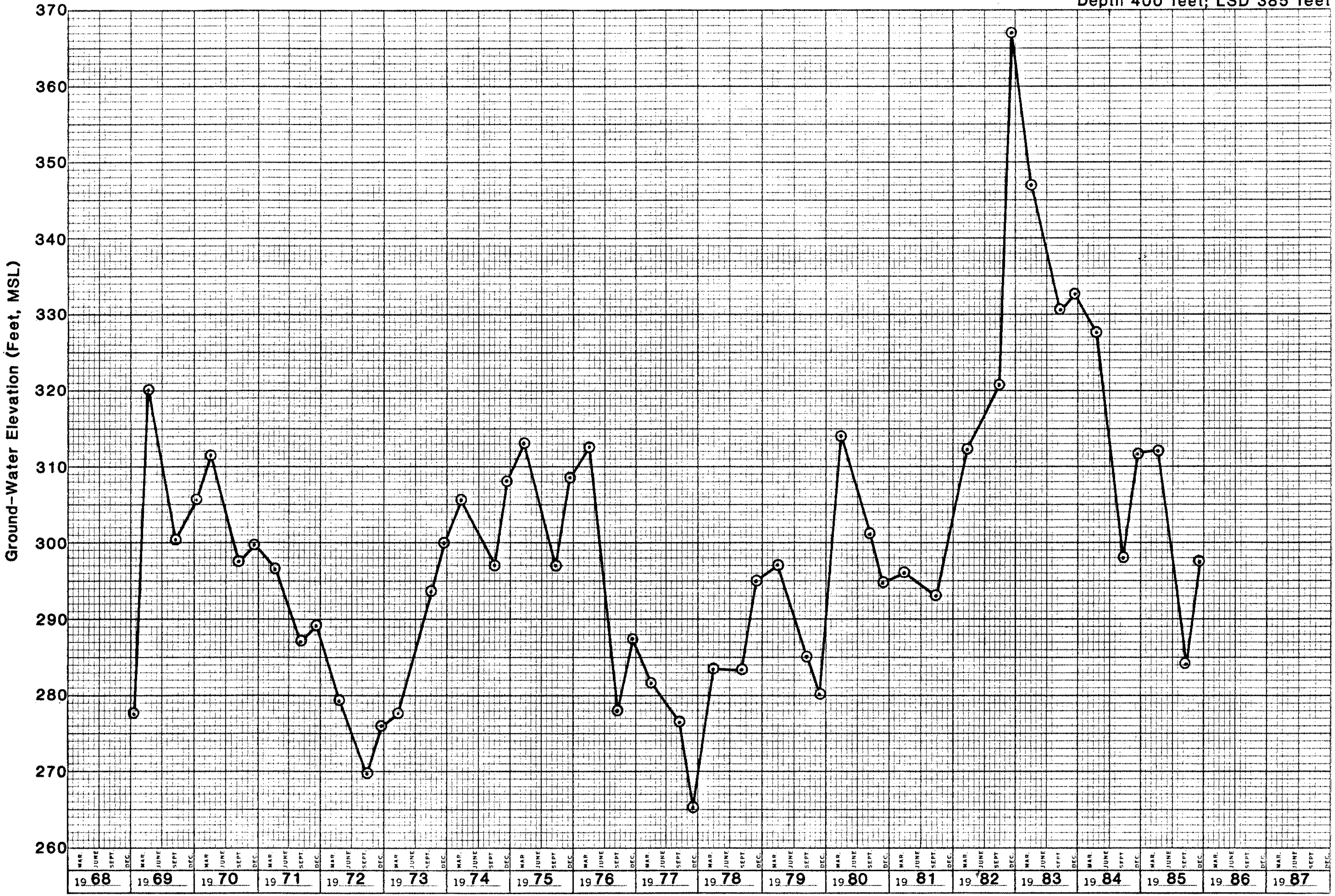
9S/3E-16C1 Forebay Area
Depth 301 feet; LSD 386 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 10

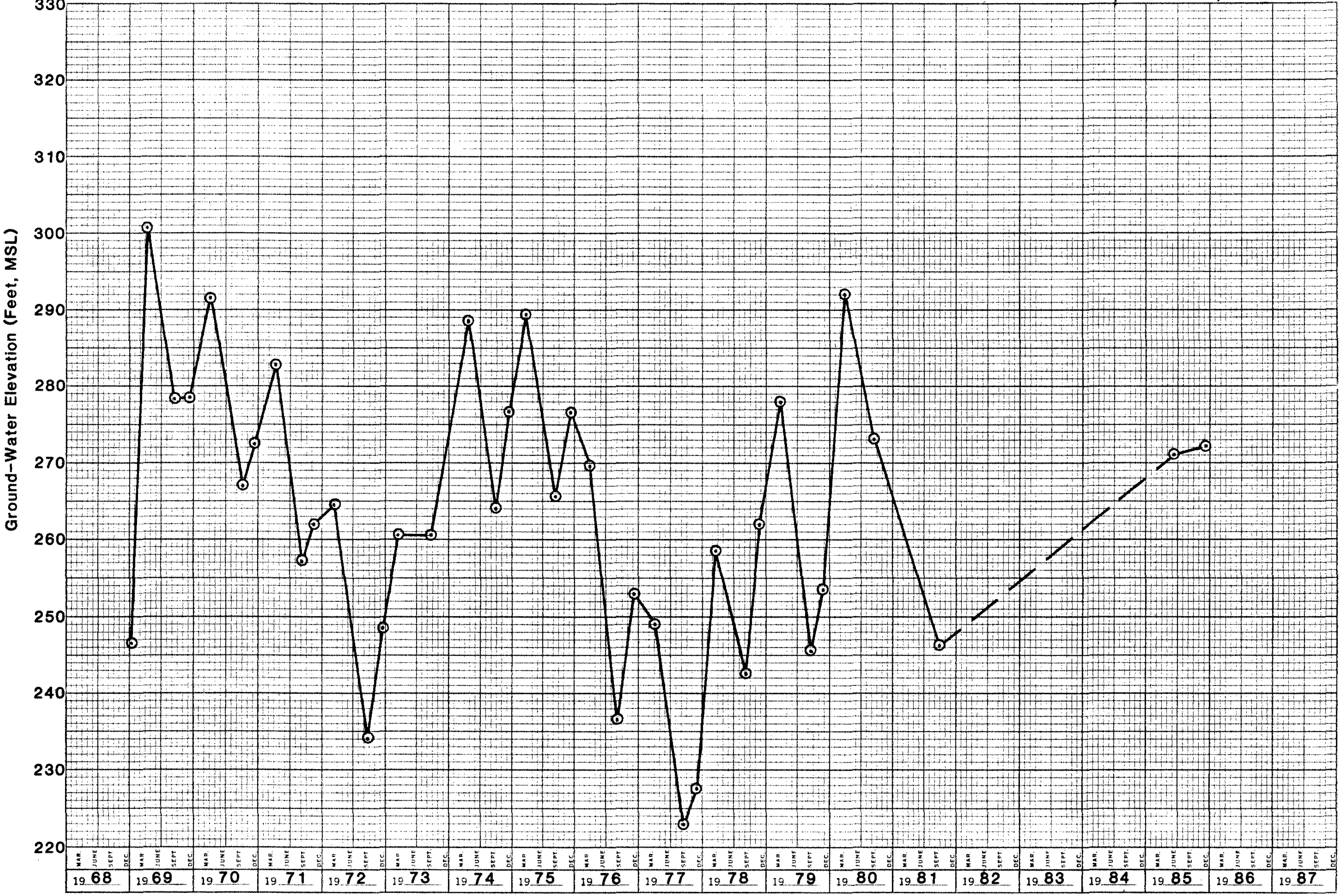
9S/3E-16J1 Forebay Area
Depth 400 feet; LSD 385 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 11

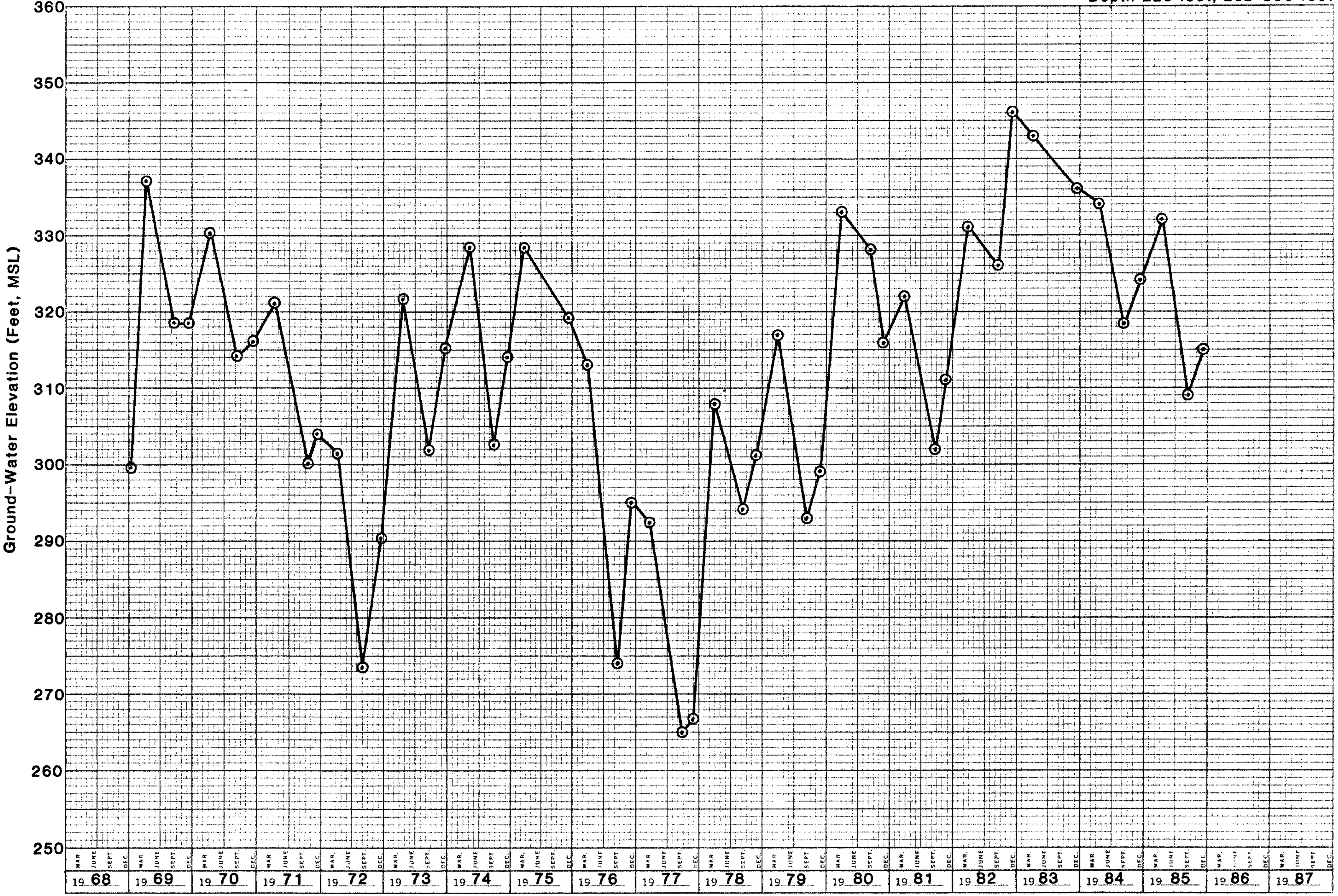
9S/3E-26P1 Forebay Area
Depth 250 feet; LSD 329 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 12

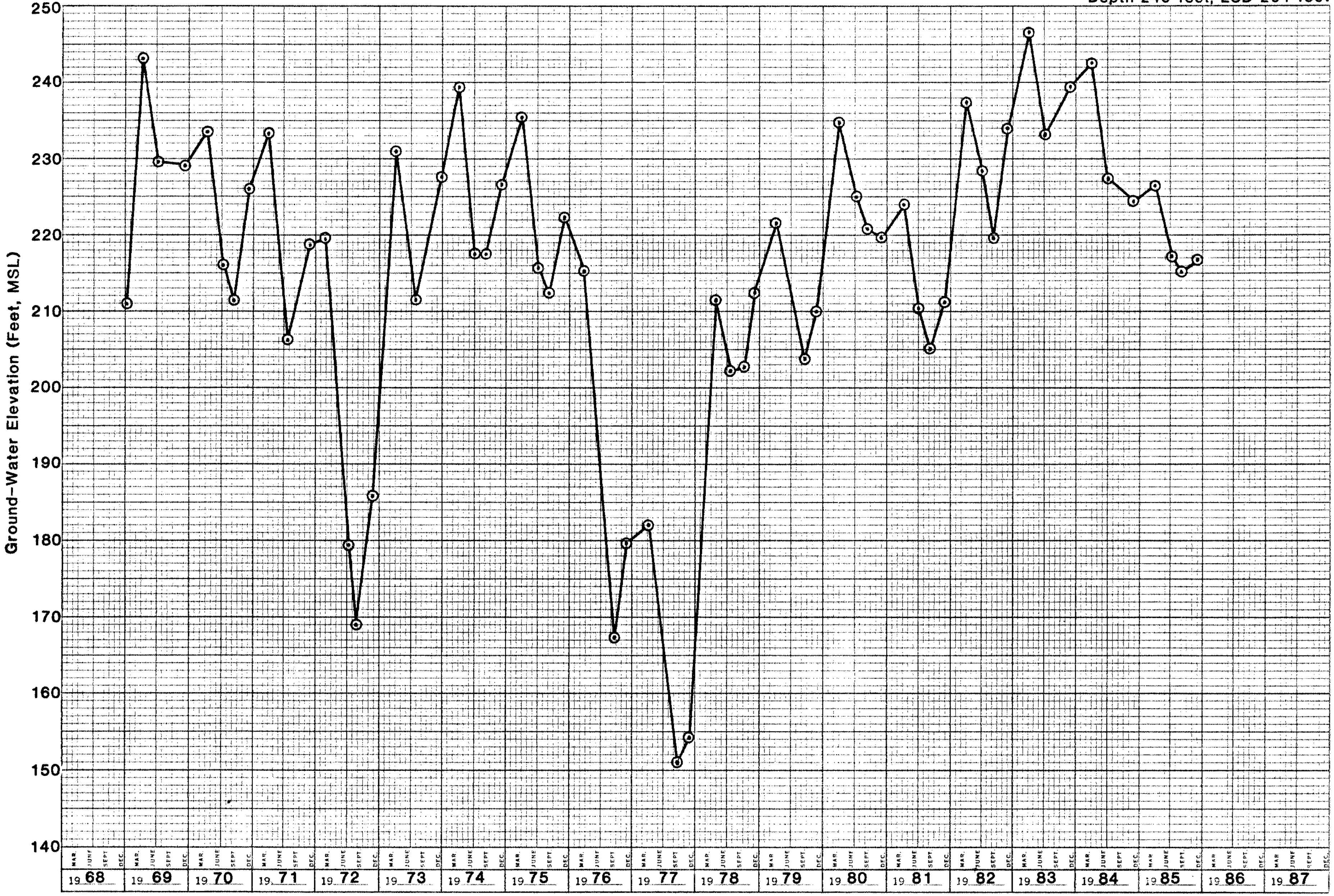
10S/3E-3C1 Forebay Area
Depth 220 feet; LSD 353 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 13

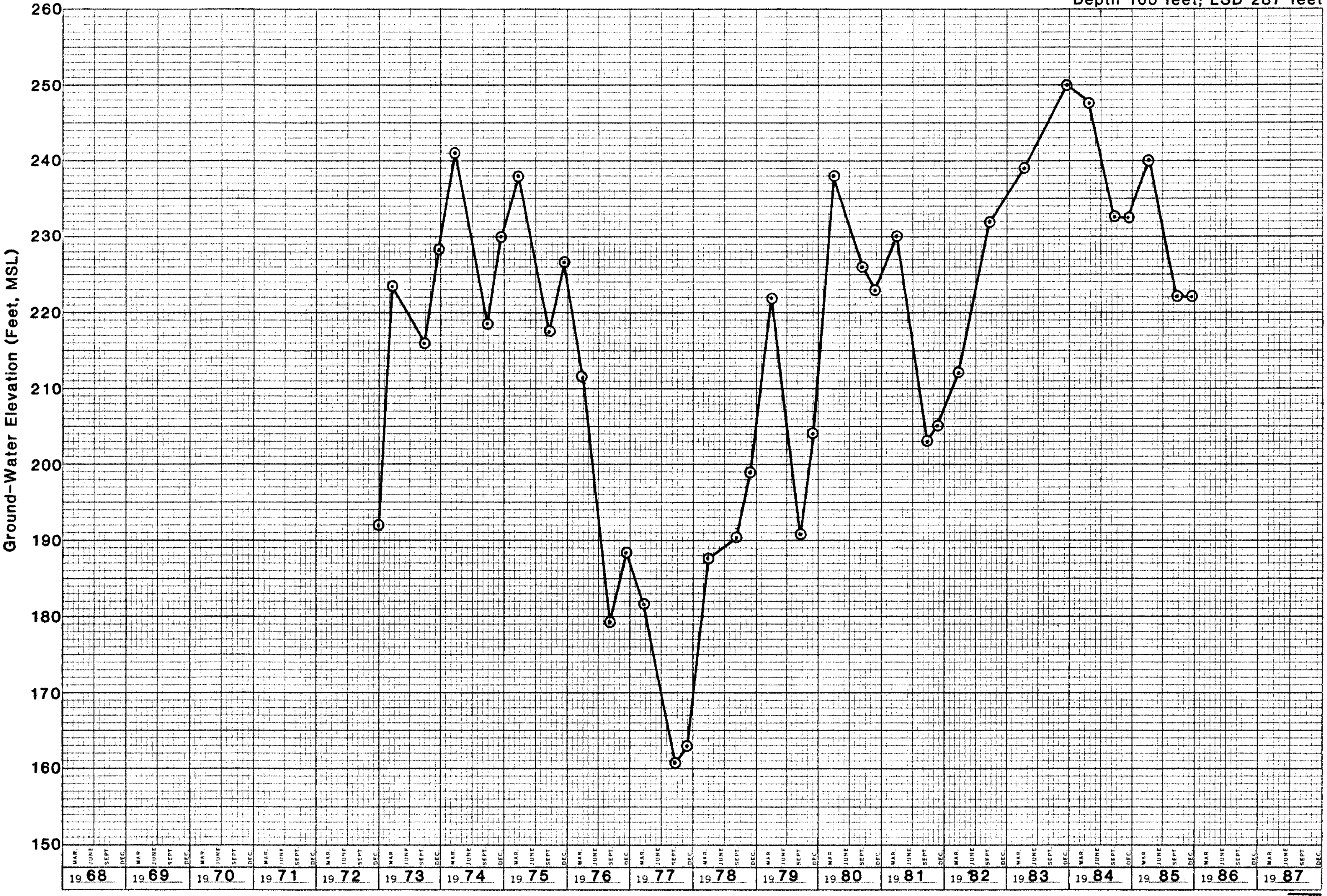
10S/3E-13D3 Forebay Area
Depth 249 feet; LSD 261 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 14

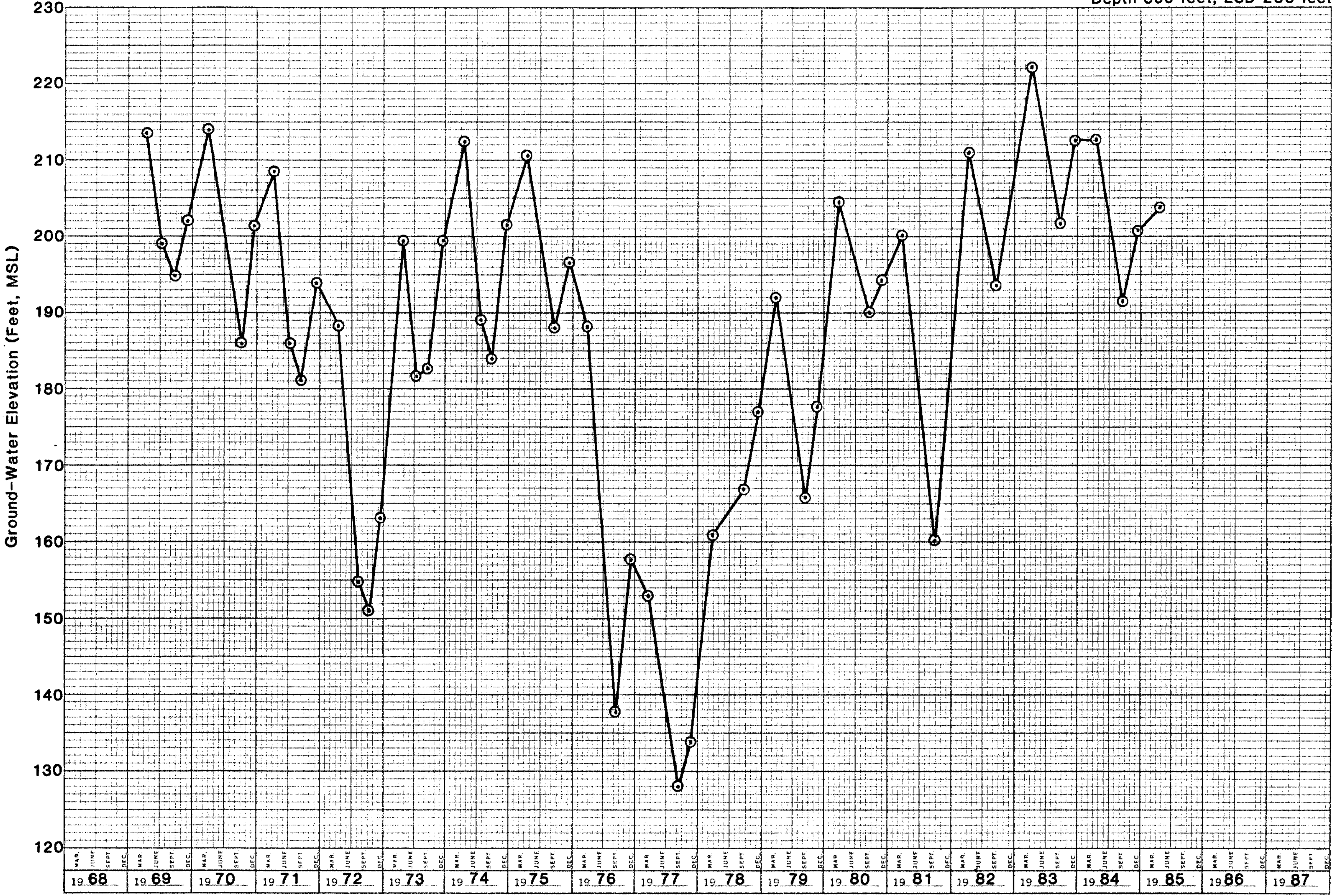
10S/4E-7E99 Forebay Area
Depth 160 feet; LSD 287 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 15

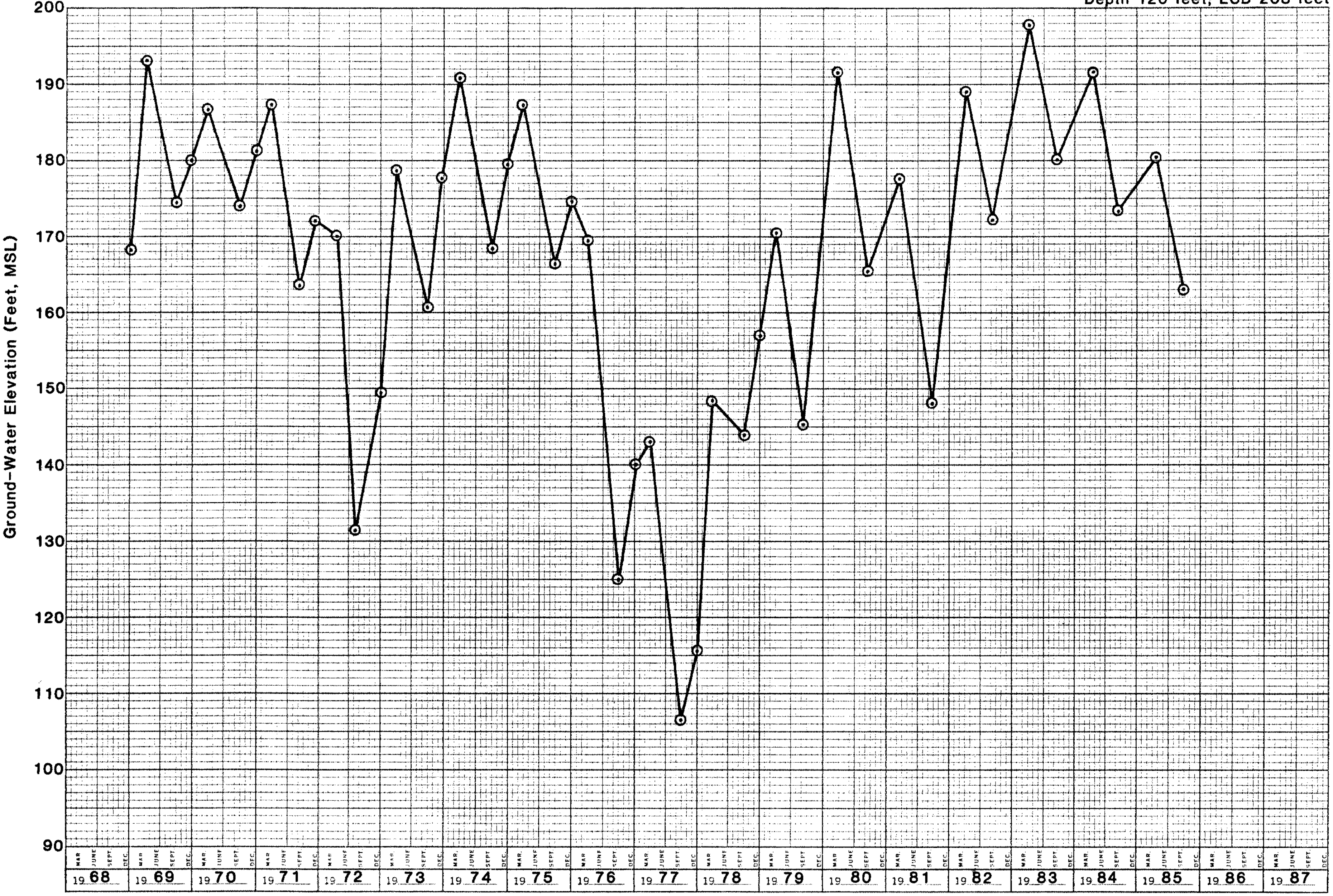
10S/4E-17N2 Forebay Area
Depth 300 feet; LSD 256 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 16

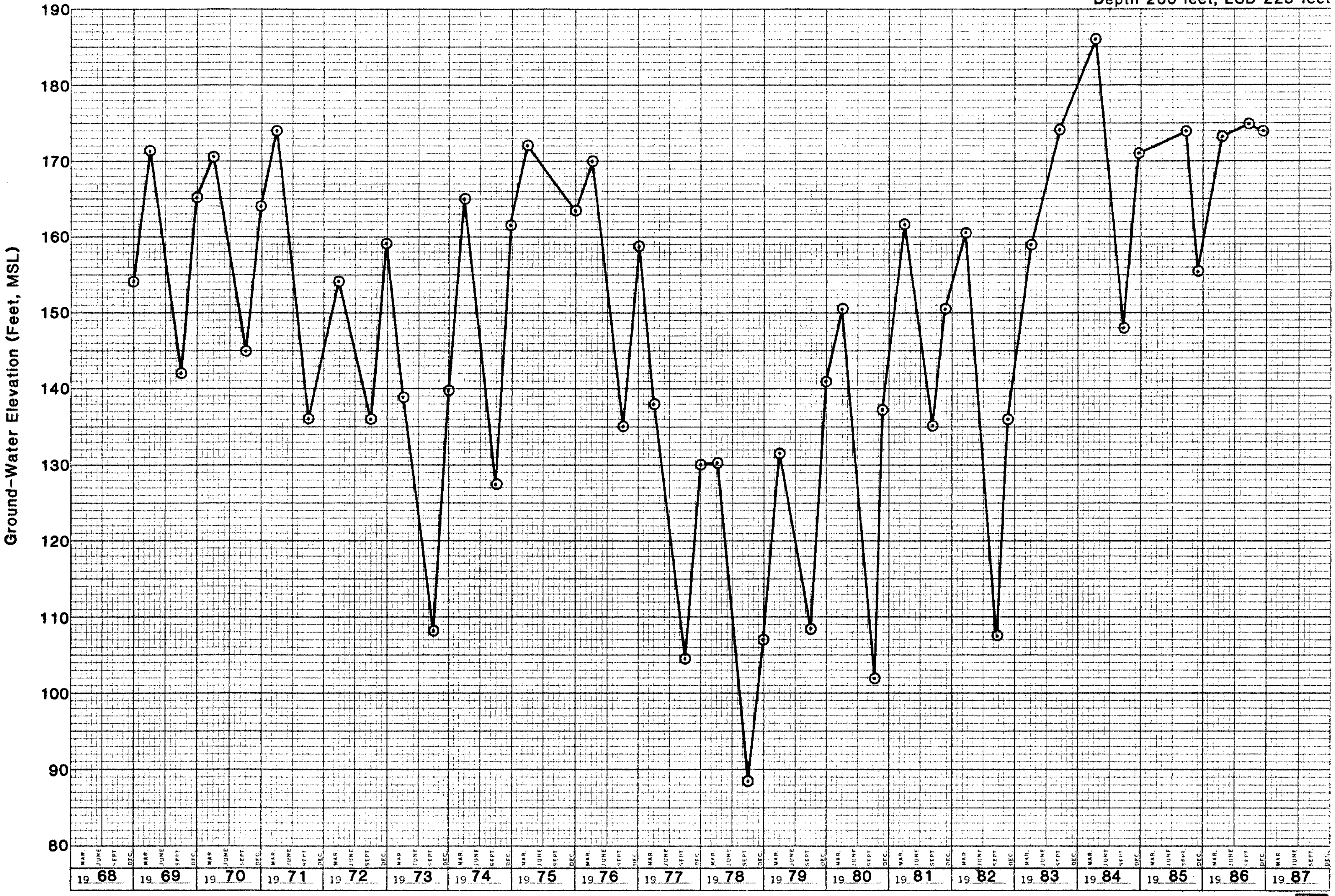
10S/4E-30P5 Confined Area
Depth 120 feet; LSD 208 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 17

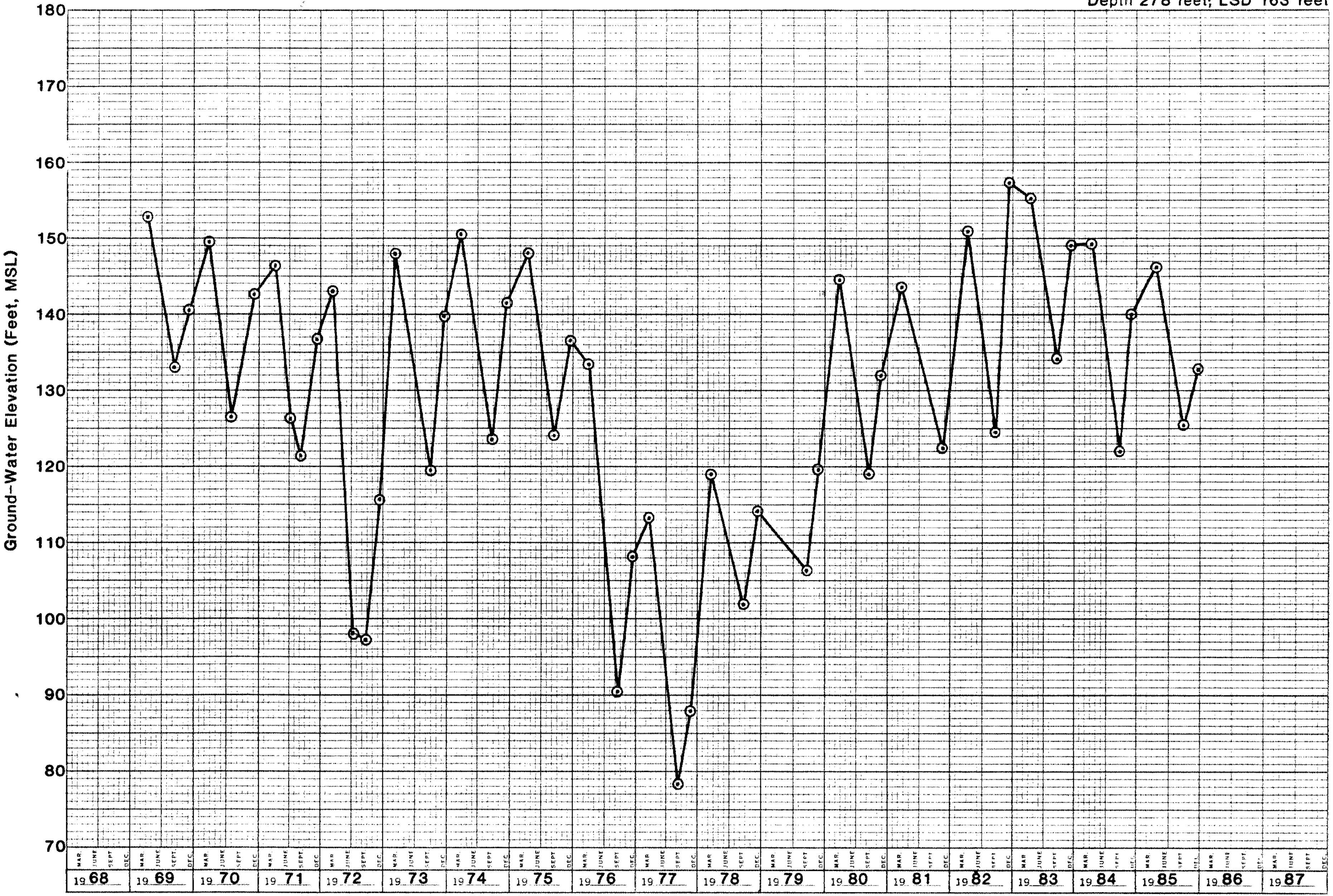
11S/4E-2D1 Confined Area
Depth 200 feet, LSD 229 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 18

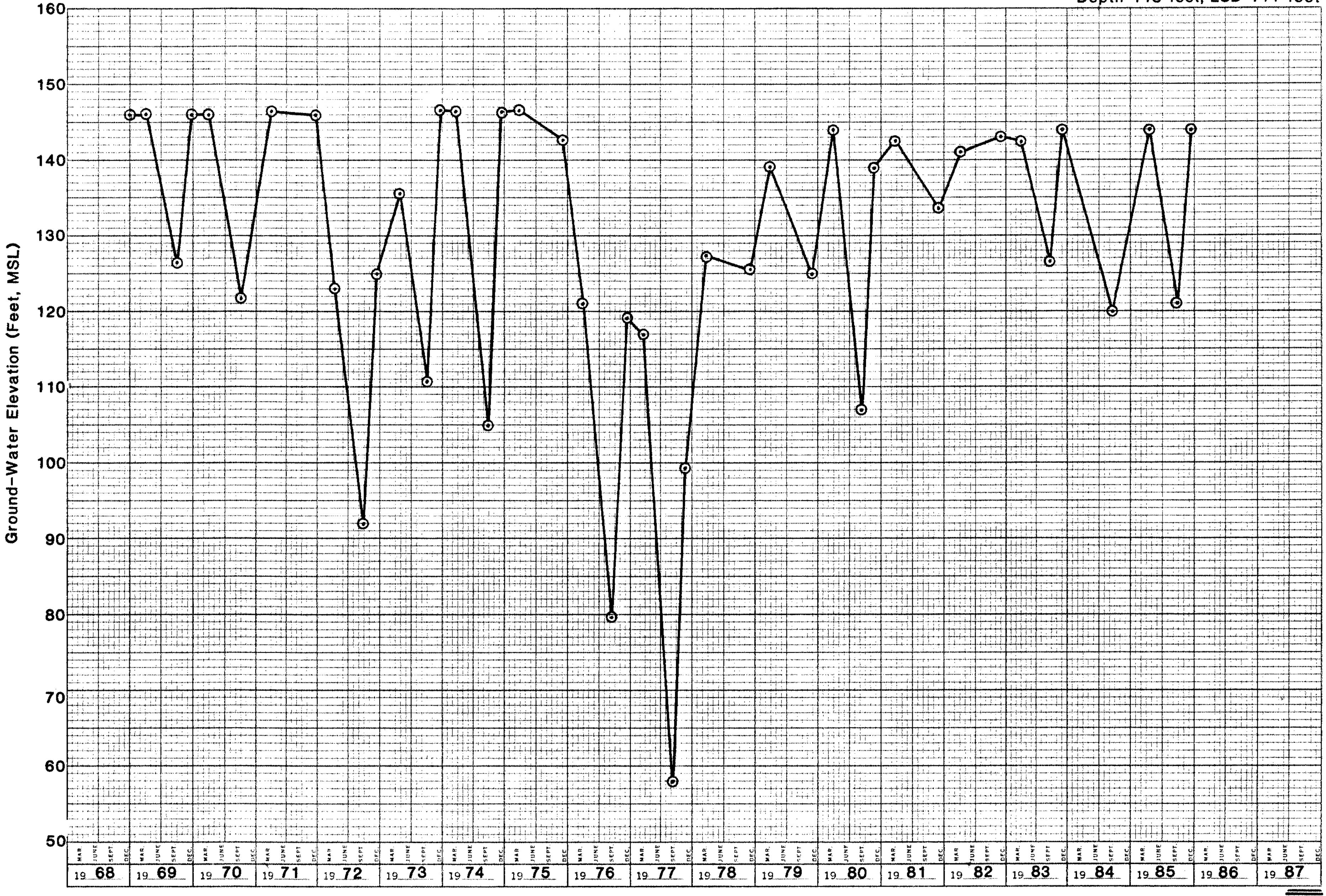
11S/4E-8K1 Confined Area
Depth 278 feet; LSD 163 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 19

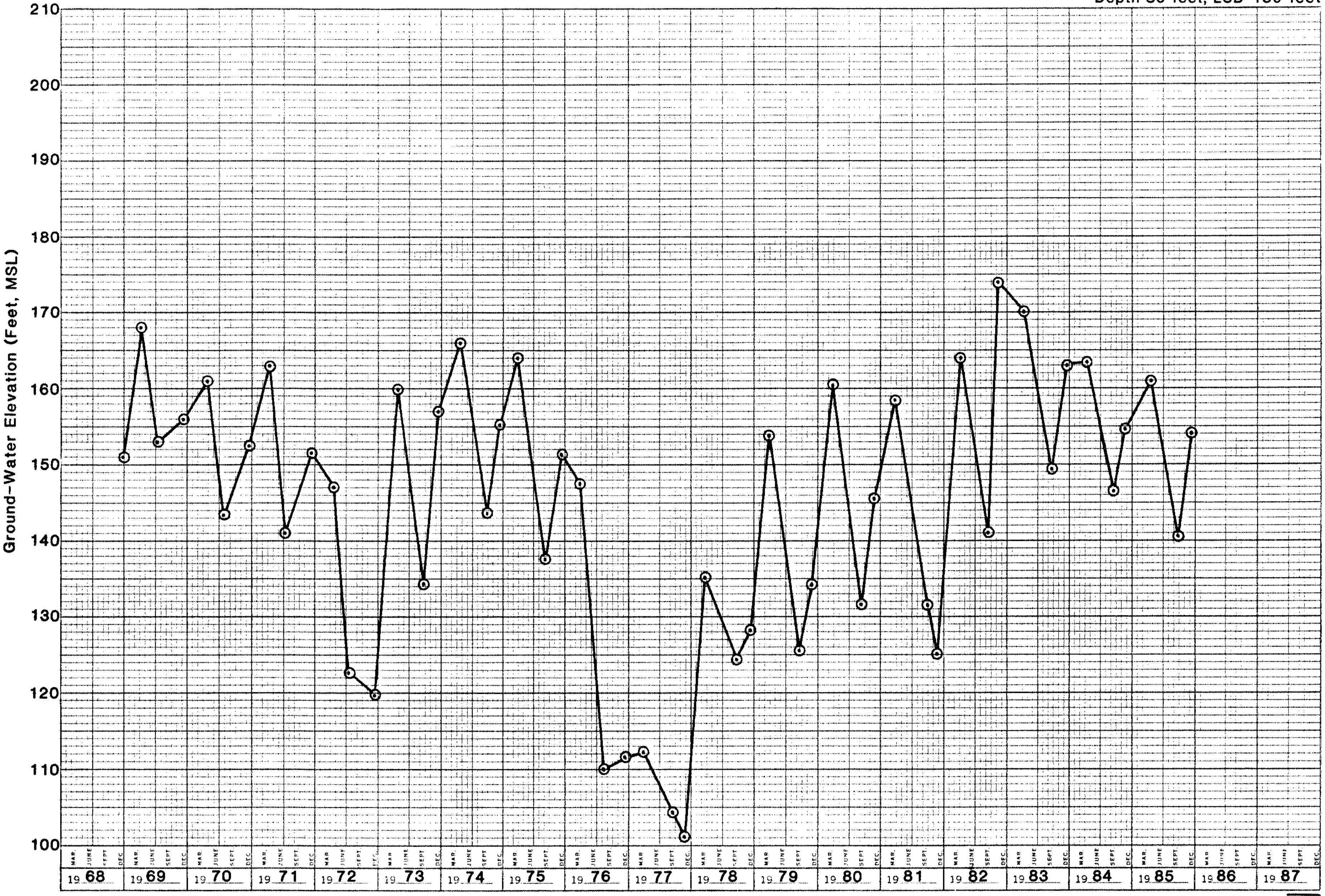
11S/4E-15J1 Confined Area
Depth 448 feet; LSD 144 feet



Historic Ground-Water Elevation Hydrograph

FIGURE 20

11S/4E-17M1 Confined Area
Depth 80 feet; LSD 180 feet



1960's levels. Further, the recent trends are similar to earlier short term trends, which may have been related to some combination of pumpage and recharge in the area and which ultimately changed, apparently due to different hydrologic conditions such as an apparently dry year in 1972 and ultimately the drought of 1976 and 1977. In the confined area at the south end of the District, there is evidence of both relatively constant water levels and slight declines over the last two or three years. In all cases, long term trends indicate water levels which have changed very little or not at all over the past 15 to 20 years.

Ground-Water Pumpage

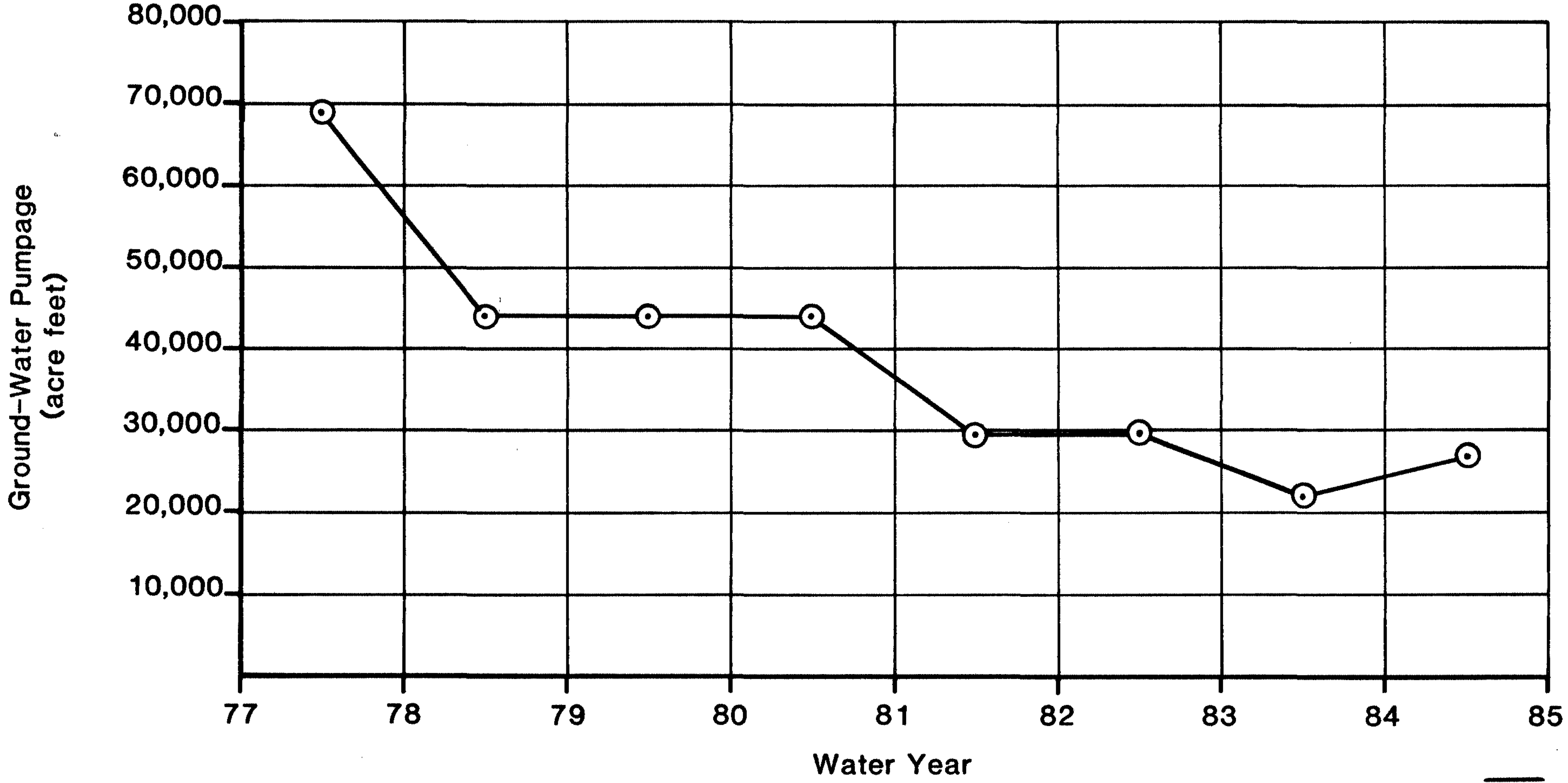
Based on user-charge reports to the District, ground-water pumpage throughout the District during 1984-85 amounted to approximately 27,000 acre-feet. Approximately 64 percent of total pumpage was for agricultural irrigation; the balance was primarily for municipal distribution, with some for industrial and individual domestic use.

For comparative purposes, recent historical pumpage has been tabulated and plotted (Figure 21) since 1977-78 when the District began keeping records of pumpage.

Reservoir Storage and Ground-Water Recharge

From its two reservoirs, Chesbro and Uvas, the District releases storage for both in-stream and off-stream ground-water recharge. Releases from the Chesbro Reservoir are routed from Llagas Creek into the District's recharge ponds on Church Avenue. Releases from the Uvas Reservoir are partially retained for in-

FIGURE 21
Historical Ground-Water Pumpage
Gavilan Water Conservation District



stream recharge between the dam and Christmas Hill Park; some of the Uvas releases are diverted through the Uvas-Llagas transfer line into Llagas Creek where they are combined with Chesbro releases and directed into the Church Avenue recharge ponds.

During 1984-85, a total of 4,173 acre-feet was released from the Chesbro Reservoir and 8,028 acre-feet were released from the Uvas Reservoir. During the recharge periods of the year (July-October, 1984 and May-June, 1985), in-stream recharge in Uvas Creek amounted to 4,477 acre-feet. During the same period, a total of 6,530 acre-feet was routed through Llagas Creek to the Church Avenue ponds, primarily for off-stream recharge in those ponds and partially for in-stream recharge in the creek above the pond turnout.

Ground-Water Storage and Overdraft

As defined in Water Conservation District Law, "annual overdraft" is the amount of water by which ground-water production exceeds the natural replenishment of such ground-water supplies in a given water year. "Accumulated overdraft" is defined as the amount of water necessary to be replaced in the intake area (forebay) of the basin to prevent the landward movement of salt water or to prevent land subsidence. The latter two considerations are not directly applicable to the District, although subsidence could be of some concern if water levels were sufficiently lowered to dewater subsurface fine-grained materials and allow consolidation of them to occur.

To address "annual" and "accumulated" overdraft as required, some consideration of ground-water storage, pumpage, and recharge is necessary. To quantify ground-water storage and changes in storage, it is necessary to have well test data which would permit calculation of aquifer storage coefficients in the various confined, unconfined, and forebay (locally confined to unconfined) areas. Although such values are not generally available, a mathematical model developed by DWR (1981) addressed the various components of an overall hydrologic balance, including changes in ground-water storage, for the period 1964 through 1973; but the model could not be verified due to lack of historic data. The unverified results of the DWR work indicated a net increase in ground-water storage of nearly 39,000 acre-feet over the '64-'73 time period. More recently, the Santa Clara Valley Water District, in its Water '82-'83 report, utilized two methods to compute net changes in ground-water storage; the results indicated a net increase of 10,000 to 11,000 acre-feet for that year.

The District has not undertaken calculation of ground-water storage calculations for 1984-85 but has elected to utilize ground-water levels as indicators of recent and long-term changes. As discussed in the section on water levels above, there have been general declines in ground-water levels over the past two years; but longer term indications are that water levels are nearly constant over the past 15 to 20 years. Changes in ground-water storage would correspond to those water level variations. There has been a recent decline in storage through much of the District, but little or no change in storage over the longer, latter period.

As part of its monitoring program, the District is planning to conduct well testing in order to allow determination of aquifer characteristics in the various aquifers and to follow that with future computations of ground-water storage and changes in storage. For now, it appears that ground-water storage is in a short-term decline, similar to earlier historical cycles; but ground-water storage remains essentially unchanged over the past 15 to 20 years.

Ground-Water Quality

As part of its Santa Clara Valley Ground Water Quality Investigation (DWR, 1980), the State Department of Water Resources sampled 198 wells in the south Santa Clara Valley. Based on that data, areas of elevated nitrate and electrical conductance were first defined in the District. At that time, DWR noted that, due to incomplete or nonexistent well construction details, it was not possible to develop conclusions regarding differences in quality between the shallow and deep zones.

During 1985, as part of the ground-water monitoring program, ground-water quality data was collected by the Gavilan Water Conservation District, the Santa Clara Valley Water District and the City of Gilroy. The 1985 water quality data are summarized in Tables 5 and 6.

Areal water quality maps have been prepared for nitrate concentrations (Figure 22) and total dissolved solids concentrations (Figure 23). Included in both figures are the areas which were initially determined by DWR as having relatively high nitrate or total dissolved solids concentrations, the latter as estimated from electrical conductivity. Added to those areas, based on 1985 water quality data, are new or expanded areas of elevated nitrate and TDS concentrations.

TABLE 5

GROUND-WATER QUALITY MONITORING PROGRAM
INDICATOR PARAMETERS
1985
GAVILAN WATER CONSERVATION DISTRICT

STATE NO.	WELL IDENTIFICATION	SPRING TDS	FALL TDS	CHANGE TDS	SPRING Cl	FALL Cl	CHANGE Cl	SPRING NO3	FALL NO3	CHANGE NO3
09S/3E-20F01	Khan	328	320	-8	9.3	9	-0.3	11.5	8	-3.5
09S/3E-21	Sasser	180	320	140	15	18	3	23	16	-7
09S/3E-26N07	Serrano	340	400	60	23	21	-2	58 *	48 *	-10
09S/3E-33N	Vasquez	290	280	-10	24	26	2	40	34	-6
09S/3E-35N08	Perry	324	NS	NA	23	NS	NA	65 *	NS	NA
10S/3E-12A	Alfrey	318	400	82	20	23	3	56 *	46 *	-10
10S/3E-13D03	Perino	338	310	-28	27	18	-9	28	12	-16
10S/3E-24N05	Williamson	614 *	760 *	146	106	60	-46	168 *	150 *	-18
10S/3E-25D03	Blaetter	226	340	114	22	20	-2	45 *	42	-3
10S/3E-33	Colt	238	190	-48	10.2	12	1.8	4.3	2	-2.3
10S/3E-33A02	Linda Vista	500 *	670 *	170	43	43	0	29	25	-4
11S/3E-02C02	Arias	174	280	106	25	14	-11	12	4	-8
11S/4E-04C08	Lemos	312	540 *	228	25	24	-1	46 *	50 *	4
11S/4E-05L04	Sturla	414	580 *	166	22	21	-1	99 *	51 *	-48
11S/4E-10D14	Skrocki	658 *	1440 *	782	36	63	27	97 *	100 *	3
11S/4E-17	Christopher	256	360	104	20	16	-4	19	17	-2
11S/4E-17R02	Santos	350	520 *	170	28	37	9	38	24	-14
11S/4E-21H05	Bettencourt	734 *	1000 *	266	91	112	21	94 *	36	-58

NS - Not Sampled
NA - Not Applicable

TDS - Total Dissolved Solids Concentration (mg/l)
CAC, Title 22 Maximum Contaminant Level Recommended -- 500 mg/l

Cl - Chloride Concentration (mg/l)
CAC, Title 22 Maximum Contaminant Level Recommended -- 250 mg/l

NO3 - Nitrate Concentration (as nitrate) (mg/l)
CAC, Title 22 Maximum Contaminant Level -- 45 mg/l

* - Concentration greater than or equal to CAC, Title 22 Standards

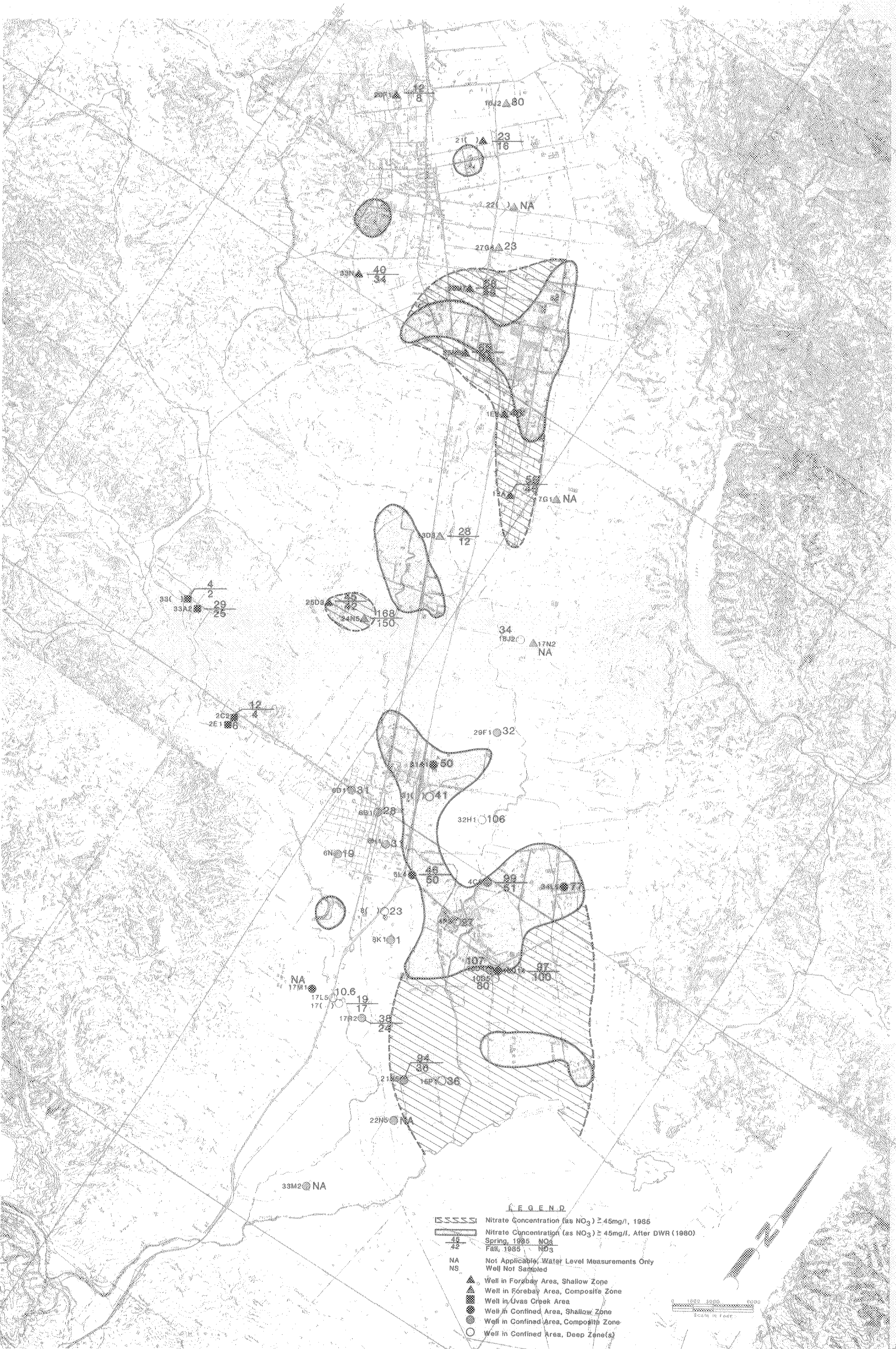
TABLE 6

GROUND-WATER QUALITY MONITORING PROGRAM
GENERAL MINERAL AND SELECTED INORGANIC CONSTITUENTS

AREA AGENCY ZONE	STATE WELL NO.	WELL IDENTIFICATION	EC umhos/cm	pH	Hardness as CaCO3	Ca	Mg	Na	K	SO4	Cl	HCO3	NO3	F	TDS	Fe	Mn	Pb	Se	WATER TYPE
									Constituent Concentrations mg/l											
F 3 SCVWD	09S/3E-16J02	Oliva	710	7.7	318	77.8	30.0	26	1.4	78	37	206	80 *	0.14	444	0.14	<.01	<.01	<.01	CaHCO3
F 1 GWCD	09S/3E-20F01	Khan	405	8.1	194	7.0	43.0	5	NA	4.8	9.3	180	12	0.65	328	0.15	<.01	0.04	<.01	MgHCO3
F 1 GWCD	09S/3E-21	Sasser	540	8.2	147	34.0	15.0	27	NA	30	15	146	23	0.10	180	0.16	<.01	0.04	<.01	CaMgHCO3
F 1 GWCD	09S/3E-26N07	Serrano	540	7.9	203	35.0	28.0	20	NA	38	23	138	58 *	<.1	340	0.10	<.01	0.04	<.01	MgCaHCO3
F 3 SCVWD	09S/3E-27G04	City of Morgan Hill	485	7.6	194	46.5	18.9	30	1.3	43	23	180	23	0.17	292	0.13	<.01	<.01	<.01	CaMgHCO3
F 1 GWCD	09S/3E-33N	Vasquez	365	7.5	138	24.0	19.0	12	NA	8	24	86	40	0.10	290	0.20	<.01	0.03	<.01	MgCaHCO3
F 1 GWCD	09S/3E-35N08	Perry	495	7.5	191	37.0	24.0	16	NA	30	23	120	65 *	<.1	324	0.11	<.01	0.04	<.01	MgCaHCO3
F 1 SCVWD	10S/3E-01E02	Hudson	500	7.4	222	45.7	26.2	27	0.8	40	33	160	46 *	0.13	327	1.20 *	<.01	<.01	<.01	CaMgHCO3
F 1 GWCD	10S/3E-12A	Alfrey	565	7.8	233	44.0	30.0	15	NA	38	20	168	56 *	0.38	318	0.15	<.01	0.03	<.01	MgCaHCO3
F 3 GWCD	10S/3E-13D03	Perino	610	7.7	261	50.0	33.0	14	NA	26	27	208	28	0.13	338	0.13	<.01	0.05 *	<.01	MgCaHCO3
F 3 GWCD	10S/3E-24N05	Williamson	1035 *	7.8	394	59.0	60.0	39	NA	82	106	194	168 *	0.17	614 *	0.11	<.01	0.05 *	<.01	MgHCO3Cl
F 3 SCVWD	10S/3E-24N05	Williamson	940 *	7.5	414	88.2	47.1	38	0.4	86	73	212	163 *	0.14	616 *	0.07	<.01	<.01	<.01	CaMgHCO3Cl
F 1 GWCD	10S/3E-25D03	Blaetter	630	7.7	199	37.0	26.0	16	NA	27	22	142	45 *	0.11	226	0.05	<.01	0.08 *	<.01	MgCaHCO3
UV1 GWCD	10S/3E-33	Colt	410	7.5	166	32.0	21.0	11	NA	27	10.2	146	4.3	0.12	238	0.09	<.01	0.05 *	<.01	MgCaHCO3
UV1 GWCD	10S/3E-33A02	Linda Vista	915 *	7.9	340	49.0	53.0	49	NA	188	43	186	29	0.10	500 *	0.11	<.01	0.04	<.01	MgCaSO4HCO3
C 2 SCVWD	10S/4E-18J02	Wilber	541	7.6	238	57.7	22.8	24	1.3	38	32	198	35	0.13	249	0.38 *	<.01	<.01	<.01	CaMgHCO3
C 3 SCVWD	10S/4E-29F01	Cha	447	7.8	230	46.5	27.7	14	0.8	44	19	190	32	0.17	299	0.05	<.01	<.01	<.01	CaMgHCO3
C 2 GILROY	10S/4E-31	City of Gilroy, NO.7	640	7.4	330	69.0	30.0	28	NA	38	27	210	41	0.12	380	<.1	<.01	<.01	<.01	CaMgHCO3
C 1 SCVWD	10S/4E-31A01	Set	702	7.2	342	70.5	40.3	22	0.9	77	26	256	50 *	0.13	440	0.19	<.01	<.01	<.01	CaMgHCO3
C 2 SCVWD	10S/4E-32H01	Noll	515	7.5	204	49.7	19.4	23	1.4	63	34	192	106 *	0.23	305	0.03	<.01	<.01	<.01	CaMgHCO3
C 1 SCVWD	10S/4E-34L05	Crumrine	797	7.1	258	74.5	17.5	49	1.2	60	70	172	77 *	0.23	526 *	0.72 *	<.01	<.01	<.01	CaHCO3Cl
UV1 GWCD	11S/3E-02C02	Arias	495	7.7	193	41.0	22.0	16	NA	45	25	142	12	0.16	174	0.18	<.01	0.04	<.01	CaMgHCO3
UV1 SCVWD	11S/3E-02E01	Thomas	400	7.8	180	36.9	21.3	17	1.0	42	21	156	6	0.13	249	0.06	<.01	<.01	<.01	CaMgHCO3
C 3 GWCD	11S/4E-04C08	Sturla	835	7.9	361	62.0	50.0	22	NA	98	22	232	99 *	<.1	414	0.21	<.01	0.05 *	<.01	MgHCO3
C 2 SCVWD	11S/4E-04P03	McMillan	506	8.0	206	53.7	17.5	30	1.6	38	23	206	27	0.14	323	0.05	<.01	<.01	<.01	CaHCO3
C 1 GWCD	11S/4E-05L04	Lemos	718	7.8	292	61.0	34.0	24	NA	38	25	240	46 *	<.1	312	0.03	0.07 *	0.06 *	<.01	CaMgHCO3
C 3 GILROY	11S/4E-06B01	City of Gilroy, NO.1	540	7.8	110	48.0	24.0	24	NA	27	17	180	32	0.11	290	<.1	<.01	<.01	<.01	CaMgHCO3
C 3 SCVWD	11S/4E-06B01	City of Gilroy, NO.1	477	7.7	204	44.9	22.3	22	0.9	34	25	186	28	0.14	300	0.03	<.01	<.01	<.01	CaMgHCO3
C 3 GILROY	11S/4E-06D01	City of Gilroy, NO.2	490	7.8	220	48.0	24.0	25	NA	33	18	160	31	0.20	340	<.1	<.01	<.01	<.01	CaMgHCO3
C 3 GILROY	11S/4E-06H01	City of Gilroy, NO.3	570	8.2	230	50.0	25.0	22	NA	36	7	210	31	0.13	340	<.1	<.01	<.01	<.01	CaMgHCO3
C 3 GILROY	11S/4E-06N	City of Gilroy, NO.4	390	7.5	210	22.0	39.0	22	NA	33	16	180	19	0.14	220	<.1	<.01	<.01	<.01	MgHCO3
C 2 GILROY	11S/4E-08	City of Gilroy, NO.6	590	7.5	230	80.0	7.3	29	NA	38	17	220	23	0.12	320	<.1	<.01	<.01	<.01	CaHCO3
C 3 SCVWD	11S/4E-08K01	Mondelli	634	7.3	314	72.1	32.5	23	0.9	77	29	238	1	0.18	411	0.02	<.01	0.03	<.01	CaMgHCO3
C 3 SCVWD	11S/4E-10D04	Barreras	982 *	7.7	482	96.2	58.7	35	1.5	145	10	314	107 *	0.14	635 *	0.06	<.01	<.01	<.01	MgCaHCO3
C 2 SCVWD	11S/4E-10D05	Maier	821	7.6	382	85.0	41.2	21	1.8	87	27	306	80 *	0.11	529 *	0.03	<.01	<.01	0.02 *	CaMgHCO3
C 1 GWCD	11S/4E-10D14	Skrocki	1210 *	7.8	548	99.0	73.0	42	NA	172	36	356	97 *	0.15	658 *	0.16	<.01	0.04	<.01	MgCaHCO3
C 2 SCVWD	11S/4E-15P01	Lintini	576	7.8	232	69.7	14.1	29	1.3	48	24	220	36	0.23	376	0.15	<.01	<.01	<.01	CaHCO3
C 2 GWCD	11S/4E-17	Christopher	585	7.8	246	54.0	27.0	16	NA	49	20	196	19	0.34	256	0.09	<.01	0.05 *	<.01	CaMgHCO3
C 2 SCVWD	11S/4E-17L05	Barberi	444	7.9	204	46.5	21.3	19	0.9	38	18	184	11	0.14	290	0.36 *	<.01	0.03	<.01	CaMgHCO3
C 3 GWCD	11S/4E-17R02	Santos	842	7.5	309	66.0	35.0	24	NA	58	28	234	38	<.1	350	0.14	0.01	0.07 *	<.01	CaMgHCO3
C 3 GWCD	11S/4E-21H05	Bettencourt	1345 *	7.5	563	120.0	64.0	60	NA	144	91	354	94 *	<.1	734 *	0.10	<.01	0.05 *	<.01	CaMgHCO3

NA - Not Analyzed
* - Concentration greater than or equal to CAC, Title 22 Standards
NO3 - Nitrate Concentration as Nitrate

F -- Forebay Area
C -- Confined Area
UV -- Uvas Creek Area
1 -- Shallow Zone
2 -- Deep Zone(s)
3 -- Composite



LEGEND

- ▨ Nitrate Concentration (as NO_3) ≥ 45mg/l, 1986
- ▭ Nitrate Concentration (as NO_3) ≥ 45mg/l, After DWR (1980)
- 45/42 Spring, 1985 NO_3 / Fall, 1985 NO_3
- NA Not Applicable, Water Level Measurements Only
- NS Well Not Sampled
- ▲ Well in Forebay Area, Shallow Zone
- △ Well in Forebay Area, Composite Zone
- ■ Well in Uvas Creek Area
- ● Well in Confined Area, Shallow Zone
- ◍ Well in Confined Area, Composite Zone
- ○ Well in Confined Area, Deep Zone(s)

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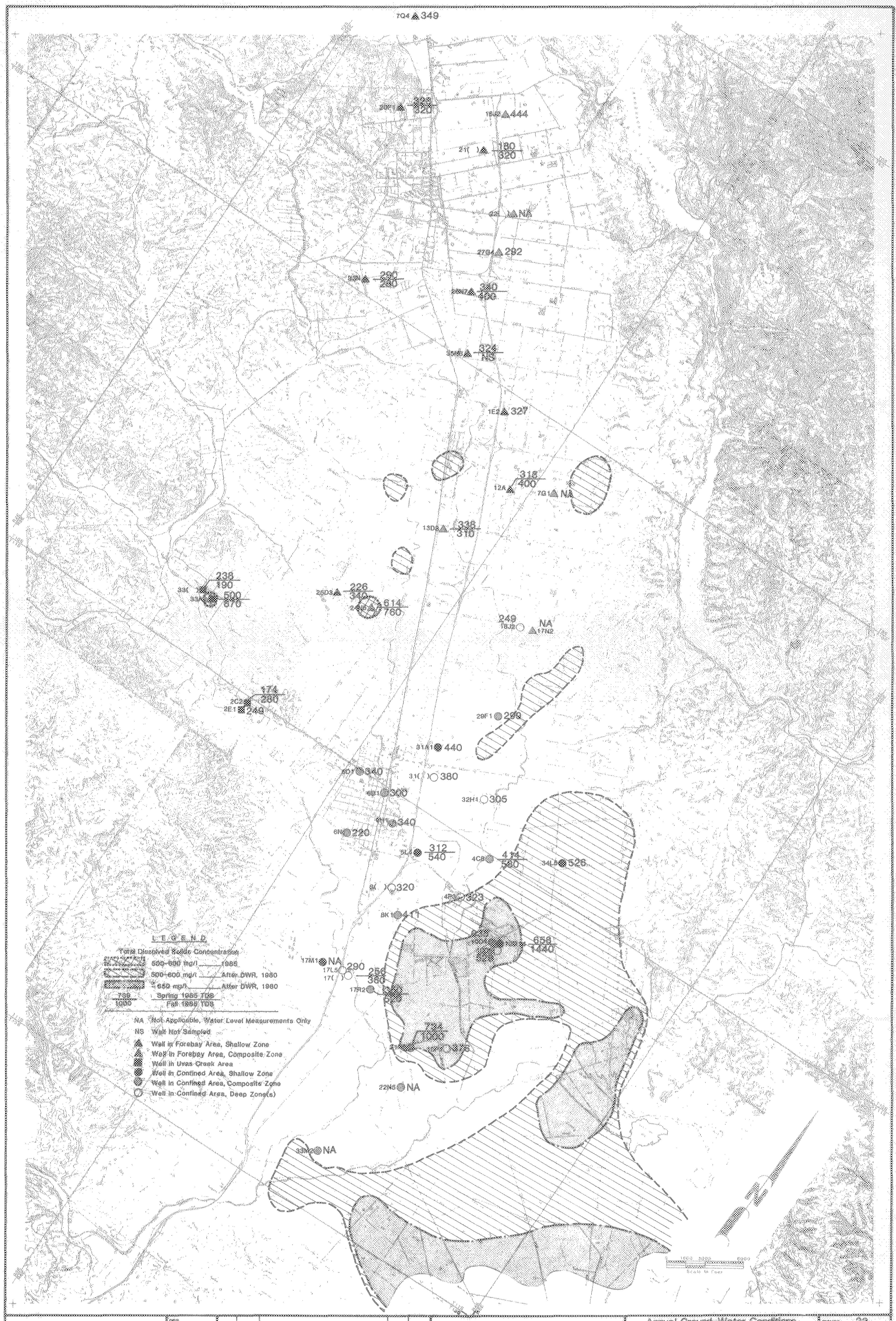
Woodland, California 95695

DES.	NO.	DATE	REVISION	BY	APPD.
DWG. BY					
CHK. BY					
APPD. BY					

Nitrate Concentrations
Llagas Subbasin

Annual Ground-Water Conditions
1984–1985
Gavilan Water Conservation District

FIGURE 22
DATE 3/86
PROJ. NO. 86-1-017



LEGEND

Total Dissolved Solids Concentration

▨ 500-600 mg/l ______ 1985

▨ 500-600 mg/l ______ After DWR, 1980

▩ > 650 mg/l ______ After DWR, 1980

$\frac{730}{1000}$ $\frac{\text{Spring 1985 TDS}}{\text{Fall 1985 TDS}}$

NA Not Applicable, Water Level Measurements Only

NS Well Not Sampled

▲ Well in Forebay Area, Shallow Zone

▲ Well in Forebay Area, Composite Zone

■ Well in Uvas Creek Area

● Well in Confined Area, Shallow Zone

● Well in Confined Area, Composite Zone

○ Well in Confined Area, Deep Zone(s)

LUHDORFF & SCALMANINI Consulting Engineers Woodland, California 95695	DES. DWG. BY CHK. BY APPD. BY	NO.	DATE	REVISION	BY	APPD.	Total Dissolved Solids Concentrations Llagas Subbasin	Annual Ground-Water Conditions 1984-1985 Gavilan Water Conservation District	FIGURE 23 DATE 3/86 PROJ. NO. 85-1-017

The 1985 data were also evaluated relative to shallow versus deep zones, and there are several noteworthy comments regarding nitrate and TDS concentrations.

1. Two extensive areas of nitrate concentrations greater than or equal to the State standard of 45 mg/l for domestic water supply exist in the Llagas Subbasin. One area is in the forebay region while the other is in the confined region. Of the 39 wells for which nitrate data was obtained during 1985, 16 exceeded the State standard.

2. Fourteen of the 16 wells exceeding the standard are completed in shallow or composite zone wells, while the remaining two are completed in deep zone wells.

3. Nitrate levels in the Uvas Creek area are among the lowest in the Subbasin. Nitrate levels in wells completed in the deeper zones are relatively lower than wells completed in the shallow zones.

4. In the confined region, seasonal nitrate fluctuations were observed in two composite wells, 11S/4E-4C8 and 11S/4E-21H5. These wells showed decreases in nitrate concentrations from 99 to 51 mg/l and from 94 to 36 mg/l, respectively. In contrast to this, two wells completed in the shallow zone, 11S/4E-5L4 and 11S/4E-D14 showed relatively minor differences in nitrate levels during the two sampling periods.

5. The extent of the identified high nitrate areas appears to be influenced by regional ground-water flow.

6. One extensive area and several minor areas of elevated TDS concentrations exist in the Llagas Subbasin. The area having the highest TDS values is located in the confined region in the southern part of the Subbasin.

7. Six of the eight wells exceeding the maximum recommended contaminant level for TDS (500 mg/l) are completed in shallow or composite zones. Of the remaining two wells, one is completed in the deeper zone of the confined area while the other is located in the Uvas Creek area.

8. As indicated in Table 5, while one or two of the indicator parameters for any particular well did not show much variation between Spring and Fall, several of the wells had an indicator parameter which varied more than would be anticipated. Generally, composite wells tended to experience the greater seasonal fluctuations in concentration.

9. TDS values generally increased during the Fall in four shallow and composite zone wells within and near the elevated TDS area.

In light of the above, it appears that the relatively poorer water quality identified in the Subbasin, as indicated by elevated nitrate or TDS concentrations, is generally in shallow formations. Where relatively poor quality water has been identified in composite zone wells, it is likely that shallow formations are the source of the relatively poorer quality water. Furthermore, the observed water quality in these wells will be influenced by the completion of the well, by local aquifer characteristics, and by local ground-water conditions.

Based on the Spring and Fall water level and water quality fluctuations, it appears that there are changes in the formations which are yielding to composite wells at different times of the year.

Organic chemical concentrations were determined for 33 wells monitored during 1985 by the Gavilan Water Conservation District, the Santa Clara Valley Water District, the City of Gilroy and the City of Morgan Hill. No volatile organic chemicals were detected in the four wells sampled by Gavilan. And, no organic chemicals were detected in the City of Morgan Hill well monitored by SCVWD or in the eight Morgan Hill wells sampled as part of the AB1803 program.

Of the 17 wells monitored by Santa Clara Valley Water District, one compound, tetrachloroethene, was detected in the following six wells:

State Well Number	Aquifer Area and Zone	Tetrachloroethene Concentration (ug/l)
10S/4E-29F1	C3	1
11S/4E-6B1	C3	1
10S/4E-32H1	C2	1
11S/4E-8K1	C3	1
11S/4E-10D4	C3	1
11S/4E-17L5	C2	1

These concentrations are all below the State action level of 4 ug/l for tetrachloroethene.

Of the 6 Gilroy wells, 3 were found to contain the organic compounds tetrachloroethene and 1,1,1-trichloroethane. Tetrachloroethene was detected in City Well Nos. 11S/4E-6B1 (Gilroy No. 1), 11S/4E-6D1 (Gilroy No. 2), and 11S/4E-6H1 (Gilroy No. 3). In well 11S/4E-6B1, 1,1,1-trichloroethane was also detected at a concentration below the State action level of 200 ug/l. The results of the City's February, 1985 sampling are as follows.

State Well Number	Aquifer Area and Zone	Constituent*	Concentration (ug/l)
11S/4E-6B1 (Gilroy No. 1)	C3	PCE; TCA	1.0; 1.18
11S/4E-6D1 (Gilroy No. 2)	C3	PCE	0.5
11S/4E-6H1 (Gilroy No. 3)	C3	PCE	0.5
11S/4E-6N (Gilroy No. 4)	C3	ND	ND
11S/4E-8 (Gilroy No. 6)	C2	ND	ND
10S/4E-31 (Gilroy No. 7)	C2	ND	ND

*PCE--Tetrachloroethene, State action level 4 ug/l
TCA--1,1,1-trichloroethane, State action level 200 ug/l
ND --None Detected

Subsequent to the sampling performed for the State AB1803 program, the City of Gilroy has performed additional determinations for chlorinated solvents with similar results.

In summary, organic compounds were detected in eight wells in the Subbasin; all were below State action levels. The presence of trace concentrations organic chemicals in the Gilroy wells has been confirmed through subsequent sampling and analysis; however, the presence of tetrachloroethene in the six wells sampled by

SCVWD has not yet been confirmed. The presence of tetrachloroethene is suspected to be possibly the result of a laboratory error rather than actual or potential contamination since the concentration of this constituent was reported as 1 ug/l in all six wells, which are located in various areas and not concentrated in one locale.

All eight wells are located in the confined area at the southern end of the Subbasin. Two of the eight wells are completed in one or more deeper zones in the confined area. The remaining six have composite completions. Included in these six wells are the three Gilroy wells in which trace levels of organic chemicals were detected. The uppermost perforations of these wells are at depths ranging from 65 to 108 feet.

4

IV. CONCLUSIONS

In summary of the preceding information, conclusions regarding ground-water conditions in the Gavilan Water Conservation District in 1984-85 include the following.

Ground-Water Monitoring--The implementation of a comprehensive ground-water monitoring network during 1985 accomplished several objectives. Spring and Fall ground-water level measurements, obtained by local agencies, were collectively analyzed for the Llagas Subbasin. Based on ground-water quality data collected by the local agencies, the current chemical quality of ground water in the forebay, confined, and Uvas Creek areas was identified. Based on the existing monitoring network, the quality of water in shallow versus deeper aquifers was also evaluated. As ground-water development continues, current ground-water conditions will serve as a basis for evaluating future trends in ground-water levels and quality. Monitoring efforts among local agencies have been coordinated to share data and reduce redundancy where possible.

Ground-Water Elevations--The direction of ground-water flow is generally southerly. During 1985, ground-water fluctuations between Spring and Fall ranged from nearly no change to a difference of nearly 40 feet. North and southeast of the City of Morgan Hill, pumping may be responsible for the apparent change in ground-water elevations from Spring to Fall. Aquifer characteristics, when determined, can be utilized to differentiate between cones of pumping depression and actual fluctuations in ground-water storage.

On a longer term, ground-water levels have remained fairly constant throughout the south County area since the late 1960's. Seasonal fluctuations are notable on all the hydrographs of representative wells in the area; and there have been some short-term trends in various locales. Overall, however, long term trends indicate that water levels have changed very little or not at all over the past 15 to 20 years.

Ground-Water Pumpage--Based on user-charge reports to the District, pumpage in 1984-85 amounted to approximately 27,000 acre-feet. Since 1977-78, when the District began keeping records, there has been a relatively continuous decline in annual pumpage from nearly 70,000 acre-feet in 1977-78 to about 45,000 acre-feet per year for the period 1978-1981, to less than 30,000 acre-feet per year since 1981.

Ground-Water Recharge--During 1984-85, a total of 12,200 acre-feet of water were released from the District's two reservoirs. During the recharge periods of those years, 4,477 acre-feet were directed to in-stream recharge in Uvas Creek and 6,530 acre-feet were routed through Llagas Creek, primarily for off-stream recharge in the Church Avenue percolation ponds and partially for in-stream recharge in the creek above the pond turnout.

Ground-Water Overdraft--Utilizing ground-water levels as indicators of ground-water storage, there have been general declines in storage over the past two years; however, that short-term trend is similar to others which have occurred in the past 20 years. Over a longer term period, the last 15 to 20 years, water levels have remained nearly constant, with intervening short-term declines and increases; the net result has been no apparent change in ground-water storage over that time period.

Ground-Water Quality--Based on the results of 1985 ground-water monitoring, there are two extensive areas of nitrate concentrations greater than or equal to the State standard of 45 mg/l for domestic water. Most of the elevated nitrate concentrations appear to be in shallow formations. Nitrate concentrations in individual wells appear to be influenced by the well's completion and pumping cycles.

There are also one extensive area and several minor areas of elevated concentrations of total dissolved solids. The major area is located in the confined region at the southern end of the Subbasin. Here again, the poorer quality water generally appears to occur in shallower formations.

Organic chemicals were detected in eight wells in the Subbasin, all are below State action levels. Tetrachloroethene was detected at the same concentration of 1 mg/l in six of the wells at widely different locations; it has not been confirmed by follow-up sampling. Possible laboratory error is suspected due to the identical concentration in samples from various locations. The organic chemical, 1,1,1-trichloroethane, was detected at a fraction of State action levels in three City of Gilroy wells and has been confirmed. Further investigation is continuing by the City.

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